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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

R
INVESTIGATIVE PROGRAM
D - 5

JANUARY 24, 1927

ANNUAL INVESTIGATIVE REPORT FOR 1926

AND

INVESTIGATIVE PROGRAM FOR 1927

DISTRICT 5

GOVERNMENT PRINTING OFFICE 8—6158

R
Investigative Program
D-5

January 24, 1927

Annual Investigative Report for 1926

and

Investigative Program for 1927

District 5

Approved February 23, 1927.

S. B. Show

District Forester.

Table of Contents

Page

Report of the California Forest Experiment Station
Organization
Budget 3
Headquarters 3
Personnel 3
Field Stations 4
Cooperation 4
Advisory council 5
Library 5
General policy
Scope and field 6
Program 6
Research by administrative officers 6
Feather River experimental forest 7
Management studies
Methods of cutting 8
Natural reproduction 10
Thinning 11
Slash disposal 11
Logging damage 12
Mensuration studies
Growth and yield 12
Temporary yield plots 13
Permanent yield plots 13
Growth prediction in selection stands . . 13
Economic study 14
Fire projects
Meteorological conditions and fire hazard 14
Fire damage 14
Rating of hazard 15
Controlled burning 15
New projects
Forest influences 15
Nursery and planting 15
Southern California 16
Feather River 16
New fire studies
Fire suppression 17
Fire breaks, fire lines, etc. 18
Foothill fires 18

Office of Forest Management
Tractor logging 19
Mill scale study at Madera Sugar Pine Co.plant 21
Effect of leaving small trees on operating profit per acre 21
Slash disposal experiments
Stanislaus 21
Lassen 22
Forest Management record 23

Page

Office of Forest Management, Con'd
Effect of national forests on county revenues 24
California Forestry Committee's donkey fuel study. 25
Experimental planting 25
Proposed investigative work for the year 1927 . . 26
Forest Management record study 28

Office of Forest Entomology
Barkbeetle control 29
Elimination of insect loss through marking 30
Interrelation of insects and slash . . . 31
Drought in relation to insect empidemics 31
Relation between insects and fire damage 32
Regional survey of insect damage 32

Office of Forest Pathology
Current projects
Cull in virgin timber
Sugar pine and yellow pine 33
White fir 33
Incense cedar 33
Cull in young timber 33
Slash disposal study, Stanislaus 34
Effect of killing diseases on reproduction . 34
Mistletoe in second growth yellow ping . . . 34
Effects of foliage reduction 35
Effects of drought 35
New projects
Relation between logging injury and decay . 35
Frost injury in Douglas fir 35

Office of Blister Rust Control

Experimental Ribes eradication
Experimental eradication by hand-pulling 36
Experimental erddication by application of chemicals 37
Reconnaissance 37
Studies in Ribes ecology 38
Further cooperation desired from the Forest Service 38

Office of Grazing 40

Eddy Tree Breeding Station 43

Page

Office of Forest Products
Report for 1926 44
Going projects, Forest Products investigations
Lumbering seasoning projects 44
Wood preservation projects 45
Utilization and waste projects 46
Economics investigations 47
Laboratory cooperation 48
New projects started 1926 49
Proposed projects 1927 50
Possible or desirable projects 51

Division of Forestry, University of California
Silviculture 53
Mensuration 53
Wood utilization 53
Range management 53
Forest management and logging 54

January 24, 1927.

R
Investigative Program
D-5

REPORT OF DISTRICT 5 INVESTIGATIVE COMMITTEE MEETING

9 A. M. January 24 to 12 M January 26, 1927.

Present

Forest Service, District Office:

S. B. Show	District Forester, Chairman
T. D. Woodbury	Forest Management
J. H. Price	" "
R. L. Deering	Operation
P. P. Pitchlynn	"
J. W. Nelson	Grazing
F. P. Cronemiller	"
C. L. Hill	Products
M. R. Brundage	"
W. I. Hutchinson	Public Relations
G. W. Lyons	Supervisor, Modoc

California Forest Experiment Station:

E. I. Kotok	Director
D. Dunning	
A. E. Wieslander	
H. W. Siggins	

Office of Forest Pathology:
E. P. Meinecke
W. W. Wagener

Office of Forest Insect Investigations:
J. M. Miller
H. Person

Office of Blister Rust Control:
S. N. Wyckoff

U. S. Weather Bureau:
L. H. Gray

State Board of Forestry:
M. B. Pratt — State Forester

University of California:
F. S. Baker
A. W Sampson
F. X Schumacher

Eddy Tree Breeding Station:
L. Austin

REPORT OF THE CALIFORNIA FOREST EXPERIMENT STATION FOR 1926.

AND PROGRAM FOR 1927

E. I. Kotok, Director.

ORGANIZATION

The appropriation for the California Forest Experiment Station became available July 1, 1926. The organization and program were decided upon by August 1. Decision on location of headquarters was delayed until about October 1.

Budget

Federal SI -	$30,000.00	
" GE -	2,412.50	(1 clerk and $500 upkeep of Feather River Station.)
Cooperative-State	3,000.00	to $5,000 - General work.
" Others	3,500.00	Devil's Canyon.
	1,500.00	Los Angeles County
Total -	$40,412.50	

Headquarters

Present quarters at University of California consist of four rooms. This space must be increased within a reasonably short time to take care of Station staff and assistants. This matter is now being considered by University authorities.

Personnel

Present staff:
E. I. Kotok
Duncan Dunning
A. E. Wieslander
H. W. Siggins
Miss D. H. Vinther
Miss L. O. Baxter
Roscoe B. Weaver - Devil's Canyon.

Probable additions within year:

1 Silviculturist for southern California.
1 Ranger grade for Feather River.
1 Entomologist.

Field Stations

By March 1 the Experiment Station on request of the Forester will assemble all available data on climate, soils, forest types, land ownership, timber operations, existing experimental areas, and other material having a bearing on the final selection of permanent substations or centers of work. We feel sure that the centers of work recommended by last year's Committee will satisfactorily meet the Forester's requirements. These centers are:

1. Feather River - already established.
2. Cow Creek - Stanislaus.
3. Nevada City region - Tahoe.
4. Sisson-McCloud region - Shasta.
5. Devil's Canyon - southern California - established January 1, 1927.

In addition to these a center of work for the redwood region will also be considered, when future finances permit the extension of work within the coast redwood type.

The Committee recommended the establishment of the six field stations listed above. It suggested three more field stations be considered when adequate finances are secured, one possibly at Soquel Basin, representing optimum conditions in the southern Sierra, one in the Coast Range, and one representing the woodland chaparral types of the Sierras.

Cooperation

D-5 - District Office, Forests, Training School.
Bureau of Entomology.
Bureau of Plant Industry.
    Office of Forest Pathology.
    Blister Rust Control Division.
University of California.
    Forest School.
    Soil Technology.
    Extension Forester.
State Forester.
County Forester, Los Angeles.
County Forester, San Bernardino.
California Development Association.
Conservation Association of Southern California.
Tri-Counties Reforestation Committee.
California White and Sugar Pine Manufacturers' Association.

Advisory Council

The selection of an advisory council for the Station has been delayed until the Director has had an opportunity to canvass all agencies interested in its work. The names of 15 men, representing the professional and industrial agencies interested in our forests, will be submitted to the Secretary at a later date. An expression of opinion from the Committee as to the agencies which should be represented was solicited. The Committee favored a varied representation on the council, rather than one of practising foresters and lumbermen. Specific representation of the grazing interests is urged. A special sub-committee should be selected for southern California in addition to its representation on the State Advisory Council.

Library

The Station is assembling a working library of manuals, handbooks, general treatises and important periodicals for immediate use at headquarters. A list is being compiled to include the best books available in each field. These are to be obtained by transfers of available copies from other Government agencies and by purchase. Members of the staff have full library privileges at the University.

In addition a literature reference card catalogue is being built up to cover as completely as possible all old and current references to literature of interest to the Station wherever published. Several thousand cards are already prepared. One difficulty in preparing such a catalogue is lack of suitable subject headings. The subject grouping of library associations, the Library of Congress, the forest schools, the Forest Service, and other special libraries do not fit experiment station needs, so far as investigated. Apparently the other experiment stations, so far as known, are using some of the above systems or modifications of them. There is a definite need for a special subject catalogue applicable to forest research. It would seem to be profitable for the experiment stations to cooperate in working this matter out.

GENERAL POLICY

Scope and Field

Fundamental and empirical studies -
National, state, and private forest lands in D-5.

Program

It may be stated at the outset that the Station program contains little that is new since last year. Last year's program, as approved by the Committee, formed the basis for the discussion with the Chief of Research during organization of the Station, and was approved by him with but little change.

It has been our aim to restrict the program to projects that can be adequately handled with means available. A large program of projects of long standing was inherited from Mr. Show's regime. Necessarily some new work of varied character has crept in. Much of the season has been spent in trying to catch up with back work, principally office work. In this we have not been entirely successful. This is due to several causes, - Show's transfer, late organization of the staff, and inability to find necessary men, moving, a bad fire season, and the necessity of the Director spending much time on organization work. It has been necessary for the new members of the staff to become oriented before employment of much temporary help.

Research by Administrative Officers

The Committee last year considered the important question of minor investigative projects by the administrative personnel on the Forests. The Forester urges that the Committee give serious consideration to this question. The desirability of each ranger following through a small plot of some kind where he will have an opportunity of seeing it frequently can be set up as an objective. If this will train men and stimulate their interest in forestry, it is more important than any immediate contribution to our professional knowledge.

This subject was discussed at length and the Committee offered the following suggestions: Emphasis should be placed in interesting the field force in research by putting into effect experimentally, facts already determined by research, and through simple personal studies that canbe conducted in conjunction with regular administrative work. Two types of studies should be recognized:

1. More important studies which are a part of the general research program requiring considerable technical skill.

Such studies should be projected, working plans prepared and assignment carefully made to specially qualified men.

2. Simple experiments applying known facts or working out facts of local interest, incidental to other work. These studies not to be projected. Memoranda of plans should be prepared and submitted to the Supervisor with copies to Experiment Station and District Forester.

District Office inspectors definitely plan to assist rangers in initiating minor studies during inspection work this season. The Experiment Station staff will likewise attempt to interest field men in such work when opportunity arises.

The replies of the Supervisors to this year's circular letter contained proposals for a number of studies, those requiring approval of the Forester are incorporated in the Grazing section. The others will be dealt with in special memoranda to the District Forester.

Feather River Experimental Forest

There seems to be possibilities of sales and exchanges in the Butterfly unit near Feather River Station that can be taken advantage of to develop an interesting experimental forest. When negotiations assume definite form, a thorough examination of the area will be made and a working plan prepared. By making proper allowances in the appraisal it will be possible for the first time to carry out some purely experimental cuttings on a considerable scale. It is hoped that different methods of logging can be carried out under experimental control. The detailsof cooperation between the Station, Management, and the Plumas have not yet been worked out. An experimental forest, located in this region should be of incalculable value not only to forestry but to the lumber industry as well. The possibilities of establishing an experimental forest, of sufficient size to support under sustained yield a fair sized operation, was considered. Such a forest can only be established through land exchange and financial cooperation of the lumber industry. The experimental forest would be a place for studying silvicultural systems, logging methods, training forest personnel, a training camp for the Forest School, training loggers, testing logging equipment, fire control and slash disposal. A number of lumbermen have already evinced intense interest in such a project. After further conference with the lumbermen of the state, a special memorandum will be prepared.

The Committee was impressed with the possibilities of the proposed scheme and favored securing cooperation from the lumber industry. It also favored securing authority to

engage in logging and selling logs to existing mills.

Management Studies

Methods of Cutting (Mc-1, Feather River, etc. and Mc-101)

The methods of cutting studies furnish a basis for judging the correctness of management and silvicultural practices on the national forests. The data serve as a guide for the modification of logging and marking regulations. The information is secured from permanent sample plots representing typical methods of cutting in stands of varying composition under different conditions of site. The results secured show, -

The net growth of the stand remaining after cutting and the extent of losses due to logging, slash disposal, windfall, insects, and other injurious agencies.

The relative rates of growth of different species.

The types of individual trees which grow best under varying conditions.

The progress of restocking through stimulation of advance reproduction and reseeding.

The best types of seed trees.

The frequency of seed crops and amount of seed borne.

The effects of cutting on changes in composition.

Invasion by shrubs and herbaceous weeds.

There are now under observation 26 sample plots, varying in size from 6 to 25 acres, aggregating 307 acres. These plots are located on the Shasta, Lassen, Plumas, Tahoe, Stanislaus, Sierra, and Sequoia national forests. The types represented are the east slope yellow pine, west slope yellow pine, yellow pine - sugar pine, Jeffrey pine - white fir, sugar pine - white fir, and mixed conifer. The first three site classes are represented. The plots cover the shelterwood system, heavy selection, or seed tree cuttings, and light selection cuttings.

Diameter, height, and descriptive records are kept for more than 20,000 numbered trees over 4 inches in diameter. Records of seed bearing are made for each tree. On the major plots are 427 square chains of reproduction subplots. Eight square chains on the Plumas are fenced. All the areas are mapped, some

in considerable detail. A large number of photographs are taken at intervals to show changes.

Four plots were established in 1910; ten in 1911; eight in 1913-14; one in 1921; two in 1922; and one in 1923. With the exception of four plots on the Sequoia, complete examinations have been made approximately every five years. The Sequoia plots were first reexamined ten years after establishment, but are now reexamined every five years. Most of the reproduction sub-plots have been reexamined annually.

All records are compiled in permanent form on special Atlas size sheets. Progress reports have been prepared at five-year intervals for each plot. In 1923 a general summary of results was made in Dept. Bull. 1176. Periodical articles have been published on acceleration of growth after cutting, and methods of predicting future volumes in management plans. The results have been used as a basis for modifying marking rules and logging restrictions, and in growth predictions for management plans.

A survey and analysis of recent marking and a seed crop survey were undertaken in 1926. The two Shasta plots were reexamined this spring. Reexaminations will be continued at five-year intervals. New plots will be established from time to time to represent other sites, types and methods of cutting.

The Committee recommended the establishmebt of the following plots in 1927:

1. A permanent plot on the Lassen, using the plot studied by Berry in tractor logging, combining this with a slash disposal study.

2. A new plot in the east side yellow pine to study recent modifications of marking and logging and the relationships of insect damage on poor sites.

3. A new plot and control plot on the Strawberry unit, Stanislaus, combining these with Berry's proposed logging study. These plots should also include a study of spread of Ribes in cooperation with Office of Blister Rust Control.

4. A large plot to study losses by insects on poor sites in cooperation with the Bureau of Entomology.

Compilation of 1925 progress reports is to be completed. A second Department bulletin is in process of preparation. A proposed tree classification scheme for selection stands is nearing completion. There is a possibility that some of the older plots on the Stanislaus and Plumas might be cut over again in the near future. If this is done half of the areas will be reserved for control.

Natural Reproduction (Rs Mr)

Complete dependence on natural regeneration in our cutting system makes a thorough-going knowledge of the factors controlling reproduction essential. While of first importance, the complexity of the problem has prohibited rapid progress in working out the fundamental relations with previously available funds and personnel. Close observation and instrumentation has not been possible. While, in the majority of cases, sale areas are satisfactorily stocked with advance growth, present silvicultural practice has apparently had little influence in securing new reproduction. The conditions under which advance growth was established are not well understood. What modifications of cutting are necessary in the various types under different site conditions to insure adequate restocking in the future, or permanence of stands, remains to be determined.

A considerable amount of information on quality of seed, conditions for germination and survival has been obtained from nursery and planting studies. A considerable number of purely empirical studies have served to show where progress is, or is not being made in restocking, but have yielded few facts as to causes.

Besides the reproduction subplots on methods of cutting sample areas, which are largely mere inventories of progress, there is a series of plots on the Eldorado to check rate of restocking after logging and fire, and another series on the Stanislaus to determine the effect of bear clover on seedlings.

Cone counts, designed to determine the quantity of seed borne, the frequency of seed crops, and the best types of seed trees, were continued in 1926. Some of the methods of cutting sub-plots were reexamined.

A tentative working plan has been prepared for a study which will take up systematically questions of seed supply, dissemination, conditions affecting germination, survival, and growth.

This project was productive of considerable discussion, particularly as to the emphasis which should be placed on the purely biological aspects of the problem. Management was particularly anxious for work in the sugar pine - fir type. In view of the divergent opinions, the Committee suggested a special conference to consider the plans and methods of attack for this study. Representatives of the District Office, Experiment Station and the Forest School will hold such a meeting in the near future.

During the coming season existing inventory strips will be reexamined and seed crop data on the Mc plots will be continued. In connection with fire line clearing on the Sierra and Stanislaus some plots will be established to determine the effect of removing competing vegetation.

Thinning (RS, Mt-2, Mt-101, Mt-161, and Mt-167)

While thinnings are generally impracticable at present, the length of time required to secure results from such experiments justifies beginning such work in a small way. There are now under observation 18 permanent plots, 11 thinned and 7 control. Two of these plots are in Douglas fir on the Klamath, established in 1912, 14 are on the Plumas in pure yellow pine, established in 1919 and 1920, and 2 are in sugar pine white fir stands on the Stanislaus, established in 1921. The Klamath plots have been remeasured twice and progress reports prepared. The others have been remeasured once and progress reports are now in preparation.

In 1926 no new plots were established. The two Stanislaus plots were remeasured.

It is proposed to establish other plots from time to time to include white fir and other important types and to represent other age and site classes, and methods of thinning. A good stand of white fir conveniently located on the Lassen was examined this season.

Records and progress reports should be kept up to date.

Slash Disposal (RS, Mb-1)

No new work was done in slash disposal studies in 1926 except reexamination of some reproduction strips on the Stanislaus experimental area maintained in cooperation with the offices of Forest Pathology and Forest Management.

The status of the large scale slash disposal experiment on the Fruit Growers' Supply Co. sale is still undecided, though agreement will doubtless be reached early this spring.

A study by the Lassen force was conducted to determine the amount of damage done by slash burning. The final report is not yet completed.

When the proposed project on the Fruit Growers' area goes through, some plots should be laid out by the Station in cooperation with Forest Management and Forest Pathology to establish experimental control. Additional slash disposal data will be obtained from new methods of cutting plots.

Logging Damage (See Projects Mc-1, Feather River, etc. and Mc-101)

No additional work was done in this line during 1926 by the Station. A preliminary study on a small scale was conducted by the Sierra to determine damage done by donkey logging, and a report submitted. A thorough-going study of tractor logging was made on the Lassen by Forest Management.

Additional data on logging damage will be secured from new methods of cutting plots.

The Committee recommended that specific projects in logging damage be handled by Forest Management. Show will complete the paper on logging damage and silviculture in the near future.

Mensuration Studies

Growth and Yield

Three methods of securing material for yield forecasts are being followed. For even-aged stands normal yield tables are being constructed from series of temporary sample plots representing different ages, sites, and types. Similar data are being gradually accumulated by following the history of development of even-aged stands on permanent sample plots. For selection stands growth predictions made by applying average growth rates to stand tables have been used.

Temporary Yield Plots (RS, ME-4 and ME-101)

There are available in this study approximately 645 temporary plots averaging about one-fifth of an acre in size. Of these 133 were measured by Gallaher in pure yellow pine under west slope conditions, 175 are for pure yellow pine and pure white fir on the eastern Lassen, and 337 are for mixed stands on the west slope.

Yield tables for pure yellow pine under optimum west slope conditions based on Gallaher's work have been published. Similar tables for east side yellow pine were recently published by Show. Yield tables for pure white fir have just been published by Professor Schumacher of the University of California, who used, in addition to his own, about 40 of the plots mentioned above. For the mixed types, sufficient plots have not yet been found to represent the various combinations of species for the necessary age and site classes.

Considerable work has been done to establish a basis for judging stocking for discounting normal yield tables in application to understocked or average stands.

In 1926 additional work was done on methods of applying normal yield tables. Some further data were obtained on the time required to reach breast height, and for the construction of height-diameter curves.

It is proposed to work over all existing data on pure yellow pine into a generally applicable table. In the previous studies different volume tables were used and a different basis of site classification, besides other differences in technique.

Work will be continued on the application of yield tables and the series of plots will be extended for mixed stands.

Permanent Yield Plots (RS, ME-101, ME-161 and ME-167)

The present series of permanent plots consists of one on the Plumas in pure yellow pine in the 50-50-year age class, one on the Shasta of the same species 30-40 years old, one in pure Douglas fir on the Tahoe about 50 years old and one in pure white fir on the Stanislaus about 75 years old. In addition there are five thinning control plots in yellow pine on the Plumas, one in Douglas fir on the Klamath, and one in the sugar pine - white fir type on the Stanislaus which give similar data. Progress reports have been prepared for the Shasta and Plumas plots.

No additional work was done on permanent yield plots in 1926.

It is proposed to extend the series of plots to other types, age classes and sites. In 1927 one plot will be established in white fir about 65 years old on Site 3, Lassen, which will also serve as a control for proposed thinning plots.

Growth Prediction in Selection Stands (RS, Mc-1, Feather River, and Mc-101).

In selection or cut-over stands, normal yield tables cannot be readily applied. To meet the immediate demands in management plans for predicting the volume available for a second cut, a series of diameter and height growth prediction curves have been worked up for application to stand tables.

A tentative set of such curves were prepared from records of growth on the methods of cutting plots. Corrected curves for sugar pine, yellow pine, and white fir on Site 1 have been completed from increment borings on old cuttings. Similar curves for yellow pine on Site 3 were completed by Wieslander on the Lassen.

Some additional work has been done during construction of management plans on the Modoc, Eldorado, Stanislaus, and Sierra.

No additional work of this character was done this year by the Experiment Station, except to assist in compilation of some of the management plan data. A periodical article was recently published on this subject.

The series of corrected curves should be completed by securing data from old cuttings. To test the validity of this procedure some data are needed on changes in form after cutting and the relation of basal area growth to volume growth on various sites.

Volume Tables (RS, ME-Volume Tables) -- See project sheet.

Economic Study

The phase of this study undertaken by the Experiment Station is completion of the state type map Work has been concentrated in the accessible foothill region outside the national forests. 55 townships have been completed to date. The State Forester has furnished valuable cooperation by detailing state rangers to assist in mapping. Type data are being made available by several large timber land owners. A revision of the individual forest type maps is being undertaken to bring them up to date and harmonize the type classification.

Fire Projects

Meteorological Conditions and Fire Hazard (RS, Ff-B-1 and B-5).

In cooperation with Operation and the Weather Bureau, the stations where records will be kept and forms to be used should be determined. Provision should also be made for field check and instruction of observers by the Weather Bureau. The weather station at Feather River is being reinstalled this spring.

Washington is now undertaking a preliminary study of the lightning data secured during the past three years in the three western fire districts. The California data will be assembled for this purpose this winter.

Fire Damage (RS, Pf, A-1).

The permanent plots on which the trees are followed for a number of years to determine their response to different degrees of injury were not reexamined in 1926. This will be done in 1927, as well as adding some more plots when the opportunity arises.

The California plot on which is being studied the effect on vegetative succession of repeated summer fires will be reexamined. Additional plots of this character may profitably be established.

Rating of Hazard (RS, Pf, A-3).

Show and Kotok are still wrestling with their manuscript on the spread of fires in relation to cover type. The basis for this study are the individual fire records from 1911 to 1920. It is hoped that administrative demands on the District Forester and the Director will not interfere with the completion of the manuscript this winter.

A job warranting priority which show and Kotok desire to undertake this winter is a complete statistical analysis of the individual fire reports for the period 1921 to 1925. This should amplify what has already been secured in the statistical study 1911 to 1920. The abnormal year (1924 or 1926) can also be considered in connection with this general project.

Controlled Burning on the Permanent Light Burning Plot on the Plumas Forest (RS, Pf, C-3).

Again unfavorable and undeterminable climatic conditions prevented the burning over of this area during the spring of 1926. This in itself confirms the conclusion that successive light burning is impossible, depending entirely on the vagaries of the weather. This area should be reburned again in 1927, however, if conditions permit.

New Projects

While most of the energy of the Station will be concentrated on completing or extending going projects, its increased personnel permits the addition of a few new projects. The Committee approves undertaking the new work listed.

Forest Influences (RS, I-1).

The most important problems which the Station must undertake in southern California largely revolve around studies of forest influences. Before plunging into such work, the Station proposes to carefully review all data now available in the region which bears on the problem. The man who is selected for southern California will be given a reasonable time to become familiar with the problems, so that the projects and methods of attack can be stated with precision. Such work will involve many engineering, meteorological, and ecological questions. Because

of the great public interest already present in the South, it should be easy to enlist an advisory board of eminent specialists to review any proposed program of work. Such help has already been tentatively offered by the outstanding local engineering society of Los Angeles. Financial support for these studies will come largely from southern California.

Nursery and Planting (RS, I-1 and RS, Mr).

Three lines of work are being undertaken by the Station, planting in southern California watersheds, planting and seeding on a small scale for control in the natural reproduction study, and raising a small amount of stock for experimental planting by the Station and for administrative planting on the Forests.

The success of the tractor in clearing brush lands offers an excellent opportunity for planting in areas where root competition has been a major factor. It would be advisable to initiate at least on a small scale some experiments on the Shasta brush fields at on early date.

The Station proposes to purchase a few special tools to test out the possibilities of direct transplanting of natural seedlings. This method has been used successfully in Germany.

Southern California.

A nursery is being prepared at Devil's Canyon, near San Bernardino, in cooperation with the State Board of Forestry and local county organizations. A 40-acre tract is made available with adequate water and a house for the nurseryman. Extensive and detailed maps have been prepared. Mr. Weaver, formerly in the Forest Service, has accepted the position of nurseryman and is now on the ground developing the Site.

For the coming season it is planned to secure stock for transplanting or out planting from the county of Los Angeles and other sources. About 50 to 75M stock will be distributed to the administrative organization and counties for experimental work. The Station will review the work of Munns and other investigators in this region and will continue and extend the projects which have not been completed.

Feather River

The nursery at Feather River is being put in shape this winter and seed beds will be sown this spring to produce stock for the natural reproduction study and administrative planting. The amount of stock produced there will be limited by conditions of the water supply and the small quantity of seed it was possible to obtain.

Some additional stock for administrative planting has been promised by Districts 1 and 6.

New Fire Studies

Fire Suppression

a. Methods - Tactics - Strategy - Weather (RS, Pf, B)

Whether the Station should at present undertake studies in the methods and technique of fire suppression before some of the fundamental laws, such as combustion, rate of spread in different fuels, etc., have been worked out, was presented to the Committee for consideration.

There is an enormous field in which Research and Operation can work together profitably. The Boards of Fire Review have clearly shown a great diversity of method in major strategy and tactics in the handling of fires. In tactics alone such questions as proper width of line for various cover under different climatic conditions, closeness of line to fire, time to backfire, are yet to be answered. The only place to study these are on actual going fires, and the technique for such studies have not yet been worked out. It is proposed that Research, Operation and the Weather Bureau undertake to make a complete analysis on the ground of two or three going fires. Humidity, wind, cover, topography, and the methods used in suppression should all be considered. Much of this preliminary work may help in devising methods for similar subsequent studies.

The Committee approved the project but favored that the attack should be on the practical rather than fundamental physical aspects.

b. Equipment (RS, Pf, C)

The preliminary work with horse and plow, tractors, drags, and graders and water equipment are the most encouraging signs of a new age in fire suppression. Further work with these mechanical implements should be undertaken in a systematic way for each cover type. Other implements can be improved or developed; for example, burning torches, pumps, flame throwers, and water carts. Rather than to leave these studies to an already crowded administrative organization, it seems wiser to undertake this work directly by Research and Operation as definite projects.

The Committee felt that the leadership in this should come from Operation, the Experiment Station making checks and studies.

Fire Breaks, Fire Lines, etc. (RS, Pf, C-4)

Southern California is now embarking on a large fire line, fire break program. Wide differences of opinion as to location of lines, width and character of brush disposal are expressed by local forest officers. Previous lines constructed and the careful followup of all constructed lines actually used in suppression should give a sounder basis for future construction. It is proposed to assign the southern California member of the staff to such a project. In this same connection in cooperation with Operation, it would be profitable to study the best and cheapest methods in such line construction. Chemical eradication in maintenance should be given some consideration.

Foothill Fires (RS, Pf, B-5)

A preliminary survey of the foothill fires, covering the territory outside the national forests is urgently needed. The "Role of Fire in the California Pine Forests", by Show and Kotok, and Munns' publication touched on this subject. We must have more material to determine the damage that follows such fires and how they can be controlled. This is a project which the State Forester and the Experiment Station should undertake at an early date.

OFFICE OF FOREST MANAGEMENT, D-5, WORK ACCOMPLISHED IN 1926 AND PROGRAM FOR 1927

T. D. Woodbury

Assistant District Forester

The following is a brief summary of the results accomplished during the past season on management investigative projects. The investigative work of the Forest Management personnel in the District Office is restricted to short time studies along the line of logging engineering or silvicultural problems, the results of which are directly applicable and urgently needed in our work. We have but a small amount of spare time available each year for such work and consequently our accomplishment is not large.

Tractor Logging (Project Sheet S - Supervision)

As reported in last year's memorandum, Logging Engineers Price and Berry made a study to determine tractor logging damage on a 10 chain x 10 chain plot on the Clover Valley Lumber Company sale area, Plumas Forest, during 1925. As a follow up of this preliminary work Logging Engineer Berry laid out a 10 chains square plot on the Fruit Growers Supply Company sale, Lassen Forest, in September, 1926, and carefully followed through the logging on this area to determine not only the destruction from logging, but also to find out just how and why this destruction occurred, as a basis for suggesting methods of prevention which could effectively be written into our timber sale contracts and put into effect by the men in charge of sales. The outstanding fact brought out by this study is that a large proportion of the serious damage is done, either directly or indirectly, by falling. Falling damaged 9 per cent of the trees and poles 12 inches and over d.b.h. and skidding damaged an additional 7 per cent of this stand. However, the skidding damage was largely confined to small scars at the base of trees. Only one tree, a 12 inch d.b.h. white fir, was damaged sufficiently in skidding to effect its future growth, whereas 6 per cent of the reserve stand 12 inches d.b.h. and over was uprooted or broken by falling trees. 10 per cent destruction to large poles, below 12 inches d.b.h. was also caused by timber falling. None of the skidding damage to poles of this class was serious enough to cause death. As would naturally be expected, the smaller poles and reproduction on the plot were more seriously damaged by skidding than by falling.

As a result of an analytical study of amount and cause of injury, the following suggestions in regard to remedial measures were made by Logging Engineer Berry:

1. The "bull buck" and the "cat boss" must assume responsibility for the character of the falling and skidding respectively. They should be on the area at all times to give detailed supervision and to issue instructions eliminating destructive practices. Close and intelligent supervision by these men is the secret of decreasing damage.

2. Swamping other than for landings is not necessary for tractor skidding and should be prohibited in all cases.

3. A tractor should go into its load through an opening or along the route which will be taken in bringing the load out and turn around squarely at the load instead of making a wide swing to place the chokers for the setting crew. Chokers should be unhooked from the cat or extra ones used if necessary to prevent them fouling under the tractor when it turns around.

4. When two logs from the same tree are necessary for a load, the first log hooked should be pulled along the second one and both pulled straight out rather than hooking them both at the saw cut and siwashing them out sideways.

5. When logging small timber the collection of several logs from different trees is very destructive. This practice should be confined to open places where no damage will result, unless the logs are bunched one at a time near a road, or the load should be restricted to two logs from the same tree.

6. Tractors either empty or loaded should not ramble at random over the area but should follow previous tracks whenever possible.

7. Main roads should be kept to the minimum width necessary and when two tractors meet, one of them should pull into an opening and stop until the other has passed.

8. When skidding starts at a landing each choker setting crew should choose a main road and finish it to the end rather than to try to work two roads at the same time, as this leads to confusion and cutting across by the tractors.

9. Logs should be skidded to the road to which they are pointed rather than swung around to another road.

It is evident that to put the suggested regulatory practices into effect is going to require considerable educational work both with our own men and with operators. As a step in this direction, we hope to hold a short field meeting of our project

sale men most vitally concerned on some tractor logging job in northeastern California during the early spring.

Mill Scale Study at Madera Sugar Pine Company Plant

During inspection of the Madera Sugar Pine Company sale on the Sierra Forest this summer, it developed that the lumber tally was seriously under-running the log scale -- an unusual condition. This under-run could not be satisfactorily accounted for by check-scaling or by a cursory examination of milling practice. At the request of the Company, therefore, we agreed to carry on an intensive mill scale study. This was done during October last under the direction of our Logging Engineers in cooperation with the Office of Products, the California White and Sugar Pine Manufacturers' Association, members of the Sierra Forest force and representatives of the Madera Sugar Pine Company. The results are now being computed by Logging Engineer Berry. In all, 1,348 logs were studied, divided by species as follows: 695 yellow pine, 352 sugar pine, 261 white fir and 40 incense cedar. To date we have ascertained that the lumber tally is about 7 per cent less than the log scale and that an appreciable portion of this under-run is attributable to the Company's practice of cutting pine lumber from 1/32 to 1/8 of an inch thicker than the standard thickness allowances. In addition to a check on the cutting practice at this mill, we shall derive from this study useful timber appraisal information regarding a class of timber somewhat below the average in quality for this general region.

Effect of Leaving Small Trees on Operating Profit per Acre

This study was mentioned in our memoranda for the years 1924 and 1925. The field work was done several years ago by Logging Engineer Price on a donkey logging area in mixed coniferous type. Computations were completed this year. It is planned to prepare an article during February for publication in the Journal of Forestry or Timberman.

In a word, results indicate that the maximum return per acre is obtained by leaving trees 20 inches in diameter and smaller.

Slash Disposal Experiments

Stanislaus

As reported last year, the logging on this area was completed in the early part of 1925. We are still maintaining our detection and protection force on the area and shall for some years to come until the hazard has been reduced to normal.

Lassen

The Stanislaus experiment is located in a typical heavy mixed conifer type common to the west side of the Sierra Nevada. For some time it has seemed very advisable to start a similar experiment in the east side stands of yellow and Jeffrey pine on comparatively level ground. An opportunity offered on the Fruit Growers' Supply Company sale area, Lassen Forest, this season. The object of the Lassen experiment is the same as the Stanislaus experiment, i.e., to determine the effectiveness of fire protection on cut-over areas through a system of fire breaks and intensive patrol of unburned slash compared with the standard Forest Service system of piling and burning.

A sketchy outline of the salient features of the plan for the experiment may be of interest.

Area Involved

Government	11,900 acres
Company	10,360 "

Primary and Secondary Fire Lines

The area will be broken up by primary and secondary fire lines into compartments containing not over 100 acres. Primary fire lines will be approximately 100 feet wide and will be constructed by cutting or scraping to mineral soil trails 4 feet wide along each side of the fireline. Secondary fire lines will be constructed by cutting or scraping to mineral soil trails 5 feet wide. For 50 feet on each side of these trails all slash and other inflammable debris will be disposed of.

Other Fire Lines

After logging skid roads will be cleared through each setting and unless there is a natural firebreak at the rear of each setting a trail will be cut to mineral soil there.

Detection

A special lookout man with telephone connections to the nearest logging camp will be located on Logan Mt.

Lopping of Tops

Throughout the experimental area tops will be lopped and slash will be scattered.

All snags will be felled immediately after logging.

The territory adjacent to all wagon roads in use will be protected by fire trails. Protection roads will be constructed throughout the area as required by the Forest Supervisor and all railroad grades will be put in shape for auto travel as soon as possible after the steel has been removed. Railroad rights-of way will be cleared prior to logging to the satisfaction of the Forest Supervisor.

The timber sale fire plan will be operative on the experimental area.

The experiment shall continue until fire hazard has been reduced to normal unless terminated by either party.

The Fruit Growers Supply Company assumes full responsibility for initiating and conducting all of the protective work required and for the payment of all wages, salaries or other indebtedness connected with the project.

An annual report is required from the Fruit Growers Supply Company showing character and amount of work accomplished and list of fires occurring with essential data concerning each.

By mutual consent work was started on this experiment this year, although the plan has not yet been executed or approved. Discussion of some of the proposals in the plan for some time prevented its execution. The Committee recommended the establishment of sufficient study plots, combining these with the proposed methods of cutting plot, this spring. This project will be carried on cooperatively with the Experiment Station and Forest Pathology. (See Project Sheets RS, Mb-1, and RS, Pd-4.)

Forest Management Record

Supervisors are required to cruise cut-over areas currently on a minimum 10 per cent basis and to compile a record called Forest Management Record on standardized forms showing the condition of reproduction in general terms, the estimated original stand, the stand left by species segregated by diameter groups, marking practice, brush disposal practice, site class, logging methods used and character of ground cover. The object of this record is threefold:

(a) To assemble essential management data for all cutting areas.

(b) To secure a check against the percentage of timber which we guarantee to mark in all of our timber sale agreements.

(c) To provide a historical record of cut-over areas.

As of December 31, 1925, this record was 38 per cent complete for the 10 timbered forests where considerable cutting has been done. At that time the Sierra record was 81 per cent complete and the Tahoe 15 per cent complete -- the others fell between these extremes. Taking into consideration that this work has been rated rather low

in order of priority the progress made by the majority of Supervisors is fairly creditable. The character of the data at present being secured was discussed recently with the Experiment Station staff and Mr. Hanzlik from District 6, who has had considerable experience in this line of work. It was decided at that time that the Experiment Station and the Office of Forest Management would make a cooperative study during the coming year of representative record books and field work, with a view to determining what practicable changes, if any, are needed in the general scheme. It has been suggested that the cruise of the timber left should be segregated by thrift classes and 2-inch diameter classes instead of by broader diameter class groups. This would allow of the preparation of more detailed stand and stock tables as a basis for the preparation of management plans. These suggestions should be considered very carefully and the advantage to be obtained should be weighed against the cost of extra work. The extent to which any additional requirements will slow up accomplishment must be carefully weighed also.

Effect of National Forests on County Revenues

Last February a study was started at the request of Redington to determine as accurately as possible without costly or intensive investigative work the net effect of the national forest system upon county revenues and general welfare. A circular was forwarded Forest Supervisors, asking for the following information:

1. The classification of land used by each county containing national forest land, as a basis for determining assessment valuation.

2. The unpatented acreage of each of the above classes of land in the county which is situated within each of the national forests.

3. The county tax rate or rates, applicable to the above valuation classes.

4. Gross current county taxation revenue from each of the above classes of land.

Management has fallen heir to the supervision of the collection of the data from Supervisors. Replies are now all in and Mr. Ayres is engaged in tabulating the information. At the date of writing this report no worth-while deductions can be drawn except an indication that the sum of the revenue derived from national forest receipts, plus other benefits susceptible of capitalization, will not fall far short of potential tax revenue returns from withdrawn land. Certain intangible benefits will be weighted in so far as possible and brought out in the final deductions.

California Forestry Committee's Donkey Fuel Study

Last spring the California Forestry Committee started a study of donkey fuel to determine among other things:

1. Present cost of wood fuel for various types of engines and varieties of wood.

2. Probable cost of oil fuel.

3. Effect of use of oil instead of wood as fuel upon slash disposal and fire hazard.

4. Determination of practical oiling distance from railroad tracks.

The Forest Service is vitally interested in determining the practicability of the use of oil as donkey fuel, because we at present contemplate requiring the use of oil to the exclusion of wood on sale areas in 1928. We have therefore cooperated on this study during the past season by requesting the Supervisors of eight forests to collect information on certain designated sales in regard to the amount of wood per acre removed by the use of wood as donkey fuel, the effect of removal of this wood on cost of various methods of slash disposal, effect of removal of wood fuel on fire hazard during current and subsequent years, effect on reproduction of using limbs as fuel versus their disposal by slash burning on the sale area, and volume of sparks emitted by oil burning as compared to wood burning donkeys. At this time the requested information has not been received from the field and Mr. Black has not yet prepared the report of the California Forestry Committee; therefore, no deductions can be drawn. It is my personal opinion, of course, subject to change on the basis of the investigative data presented later, that recently developed spark arrestors for wood burning engines are sufficiently effective so that it is unnecessary to insist on the use of oil as donkey fuel with attendent expense and increase of inflammable limb refuse on the areas which would be used as fuel by wood burning engines. I feel that the internal fire hazards on sale areas are now sufficiently well under control to justify us in placing the emphasis on keeping out external fires by fire lines and other precautions. A considerable proportion of our big losses on sale areas appear to be caused by such fires.

Experimental Planting

The interest in establishing small experimental plantations, particularly on recent burns, continues. In previous recent years the Lassen and Tahoe have established small plantations of yellow pine on burns. The survival to date has been quite satisfactory. Planting stock has been derived from District 6. Their surplus supply of suitable stock is now exhausted and we have no

other source of stock available. Without doubt from 25 to 50 M trees could be used annually to good advantage and it is hoped that a supply will soon be available from our own nurseries in order that this work may be well started while field men are interested in it.

During the past calendar year, small plantations of conifers have been started on the San Bernardino and Cleveland Forests with fair results to date.

The Sierra planted 1-1/2 acres (666 trees per acre) with yellow pine stock from District 6 last March at a cost of $54 per acre. The stock was planted at a low elevation near Northfork. Total failure attributed to summer drouth is reported.

During December the Stanislaus planted 229 1-0 and 1-1 coast redwood trees (Sequoia sempervirens) secured from the Scotia Nursery through the agency of Major D. T. Mason. These were planted at elevations ranging from 2200-6000 feet. Supervisor Hall reports that he intends to plant about 270 more trees in the spring. The Experiment Station hopes to supply this fall about 30 M transplants from Feather River and about 50 M from Devil's Canyon.

PROPOSED INVESTIGATIVE WORK FOR THE YEAR 1927

It is felt that the Strawberry Unit sale, Stanislaus Forest, upon which logging operations will begin this spring to continue for several years offers an excellent opportunity for the concentration of certain phases of Forest Management investigative work. The topography is representative of western Sierra conditions. The type is mixed coniferous. Site conditions are above average. The area is readily accessible and considerable research work is already centered nearby.

1. We propose another sample plot tractor logging study on the Strawberry Unit:

(a) To determine the effect of the restrictive measures worked out this year both upon logging damage and logging costs.
(b) To educate the local force in the application of these restrictive measures and to stimulate their interest in them.

Assignment -- Forest Management personnel and local forest force.

2. Although a large part of the logging on the Strawberry Unit sale will be done with tractors, some donkey logging will be necessary. We propose a check donkey logging damage sample plot study on this area as opportunity offers. Such a study should give us both cost and damage information to contrast with tractor logging cost and damage data collected on the same area. If the

results are favorable for tractor logging, considerable publicity could be secured, which should assist materially in the spread of this type of logging on western Sierra areas where tractors are comparatively little used at present.

Assignment -- Forest Management personnel and local forest force.

3. Study of depreciation of tractor logging equipment.

On account of the comparatively brief period during which tractors have been used in logging, but little reliable data has been secured regarding depreciation. It is important to secure reliable information on this point for appraisal use and as an aid in determining the probability of the continued use of tractors in logging on areas of rough topography. Information along this line can readily be secured by timber sale project men assigned to tractor logging sales.

Assignment -- various project sale men throughout the District.

4. Construction of experimental fire lines around sale areas.

I have previously mentioned the desirability of giving our sale areas further protection from fires occurring outside. On the Strawberry Unit sale, Stanislaus Forest, we shall have high values left on cut-over areas. This area is also of high recreational value and large sums have already been invested on recreational improvements on adjacent areas. The operating company will have tractors available and it is felt that a cooperative arrangement might be worked out with them under which fire lines, constructed by the use of tractors and graders, or drags, might be constructed between certain portions of the cutting area and outside territory. If such an experiment is approved, the details will have to be worked out by FM, C, the local force and the operator. The Committee favored building a fire line around Pine Crest and Madera Sugar Pine Co. sales with tractor and drag.

5. Experimental timber marking.

Several minor projects are proposed under this heading:

(a) A marking project by a marking board to consist of representatives of the District Office, the Experiment Station, the Office of Forest Pathology, and the local forest force to bring to bear accumulated knowledge and experience with the object of improving present practices and educating all concerned.

This work might well be carried out on the Stanislaus Strawberry Unit sale, and also elsewhere if time allows.

(b) A marking project with the object of making further study of the problem of marking white fir in the mixed stands and strengthening the present marking practice involving this species. It is an old story to all that white fir yields negative stumpage values and that we are obliged to pay timber sale operators to remove it by reduction in pine stumpage prices. On the other hand, we are convinced that reasonably good silviculture and forest sanitation demand the removal at least of those trees which will probably become unmerchantable by the time of the next cut. When we begin to compromise with silviculture and sanitation rather nice decision is required in order to get the most for our money.

It is felt that this problem should be dealt with by a marking board constituted as suggested under (a) above. Work should be done on both an east-side and a west-side forest. Perhaps the east-side work could be done during the proposed tractor logging conference on the Lassen in May and the west-side work might be done on the Stanislaus Forest during thecriticalmmarking study suggested under (a).

(c) A cooperative marking board project is also proposed to apply the results of Person's study of susceptibility of certain types of trees to insect attack to a going timber sale area. This project contemplates an effort to minimize insect attack through changes in silvicultural practice. The work will be undertaken by Forest Management and Bureau of Entomology men. It is hoped that others who are interested will join us and give us their assistance.

(d) An inter-district conference on the Modoc with District 6 should also be considered. The Committee heartily endorses these projects and suggests that some of the work be conducted in new permanent plots to be established.

Forest Management Record Study

This project has already been mentioned under work of the past year. An office and field check of methods and results is contemplated.

Assignment -- FM (Dunston) with assistance from the Experiment Station (Wieslander).

OFFICE OF FOREST ENTOMOLOGY

J. M. Miller, Entomologist

The research work in forest entomology for District 5 during the 1926 season was limited largely to the Sierra and Inyo National Forests. A control survey was also made of the Modoc National Forest which included some investigative work. In addition, the personnel of the Palo Alto Station has been engaged on a considerable amount of work in District 6 territory on problems that apply to District 5 as well. The present report includes all of the projects that have any bearing upon problems that concern District 5.

Barkbeetle Control (RS, Pi-1)

Control work carried on in the District during 1926 was limited to a few small projects in recreational areas in southern California. Results of this work have not been studied as it has not been possible to detail a man for the follow up examination of the areas.

The sixth annual survey of the Southern Oregon - Northern California project was made by Keen during May and June, 1926, which will furnish the basis for an analysis of the 1925 conditions on these areas. The outstanding result brought out by this survey indicates that control work carried on against increasing epidemic infestations, starting in the fall of 1924 were far more effective in reducing losses than the work carried on against declining infestation during 1922 and 1923.

Results obtained by the Long Bell Lumber Company on their Reservation Tract in southern Oregon were checked by J. E. Patterson. This company spent $28,000.00 on control during 1925 against an increasing infestation. Reduction of losses were secured on the areas worked except along the boundaries where considerable reinfestation developed from adjoining epidemics.

Control measures against the mountain pine beetle on the Crater National Park have been under study for the past two seasons. This work involved an expenditure of $7,000.00 on 10 distinct areas totaling 3,000 acres. Some of these are s were effectively isolated. The reductions of infestation varied from 49 per ce t to 90 per cent. The outstanding results of this work show that two seasons control work are often necessary to effectively clean up an infested lodgepole area and that the mountain p ne beetle may fly for a considerable distance to reinfest an area to which it is attracted. This latter

point was demonstrated by the heavy reinfestation on isolated areas that had been effectively cleaned up by control work. There is no question but these areas were reinfested by beetles coming from a distance of 4 to 6 miles.

The lodgepole control work on the Crater also included a test of the effectiveness and cost of the solar heat method of control by trimming and turning infested logs without peeling or burning them. This method was found to cost but little more and the results obtained were more effective than where the usual burning method was used.

The biological factors affecting the results of artificial control work were taken up by Person in connection with the experimental work at Northfork, California. This study consisted chiefly of life history work on an important clerid predator, Thanasimus nigriventris, and a study of its effectiveness in producing mortality of western pine beetle broods. It was found that control work during the summer destroys the broods of the predator which would normally emerge the following spring and attack the first seasonal generation of the western pine beetle and that from the standpoint of the conservation of natural predators only fall and winter control work should be permitted. This point may account to a considerable extent for the failure of summer control projects. It was also found that where a concentration of 20 predators per square foot of infested bark was developed, that the bark-beetle broods were reduced by 70 per cent from that of a normal concentration of 2 predators per square foot.

Elimination of Insect Loss Through Marking (RS, Pi-2)

Work on this project has been concentrated on a series of experiments to determine resistance to western pine beetle attack by yellow pine trees showing certain growth characteristics. The attack was artificially induced on certain selected trees by means of caging the lower part of the trunk and introducing adult beetles. After the attack was started within the cage, the attraction drew the attack of beetles flying in the surrounding area to the remainder of the trunk. Indications of resistance were determined by the amount of pitch flow, period required to successfully establish the attack, and the proportion of attacking beetles to subsequent emergence. The attack was unsuccessful, although the experiment was repeated a number of times, in the tree selected for extreme vigor of growth as indicated by annual rings and crown form. However, the attack was successful in trees showing fairly vigorous growth and unexpected resistance was found in one tree selected for its slow growth. These first experiments along this line are not conclusive and it is planned to follow them up another season.

A permanent sample plot of 80 acres was established at Cascadel to determine the characters of trees naturally selected by

the western pine beetle. All yellow pine trees over 10 inches D.B.H. were tagged, mapped, and individual records taken of crown, bark, and growth characters, together with exposure, slope, soil, site, and type conditions. These 1500 records include the insect-killed trees since 1920 from which an analysis will be made of the characters of the insect-killed trees as compared with those of the entire stand. This plot will be re-examined at intervals of several years to record additional trees that may be killed.

Due to lack of time and limited personnel it has not been possible to take up the selection of a sale area for a sample marking in which will be applied the facts so far determined as to character of the trees best fitted to resist barkbeetle attacks.

Interrelation of Insects and Slash (RS, Pi-3)

A more detailed survey of the Mono-Inyo windfall situation was made by Miller this season in cooperation with Booth and Simpson of the Inyo. The windfall, which occurred in February 1923 is estimated at 12 1/2 million board feet. Insect infestation in standing timber began to develop in and around this area in the fall of 1924. By the fall of 1925 these losses amounted to 6 million feet of standing timber. The 1926 loss, due to an epidemic infestation of the Jeffrey pine beetle, will considerably add to this figure. Another examination is planned in 1927 to complete this study.

No further work has been done on the relation of line and logging slash to insect epidemics. Two publications by the Bureau of Entomology dealing with this problem are now in the process of publication. Results of the studies so far completed lead to the position that it is only under exceptional conditions that right of way or logging slash becomes a menace to the adjacent timber that arbitrary regulations governing its disposal are not warranted from an entomological standpoint.

Drought in Relation to Insect Epidemics (RS, Pi-5)

During the course of the survey of the Modoc National Forest, made by Keen at the request of the Forest Service and private owners during the fall of the 1926 season, it was possible to secure additional data on this problem. The exceptionally severe losses, running as high as 5 per cent of the stand in 1926 on certain areas, have resulted from a consistent annual doubling of the western pine beetle infestation beginning in 1924. The period of this increase includes two seasons of pronounced drought. Certain areas have been much more susceptible than others to the epidemic conditions and the matter was studied with reference to the relations of soil and site conditions to tree growth and the correlation of these conditions with epidemics. Results of this study are now being worked into report form. Plans for further work as well as the

completion of this project are indefinite.

Relation Between Insects and Fire Damage (RS, Pi-6)

A paper dealing with the results of preliminary studies on this project in yellow pine will appear in anearly issue of the Journal of Agricultural Research.

Field work for the past season has been concentrated mainly on the Northfork burn of 1924. A complete survey was made of the 5640 acres included in this fire and the area mapped by type of burn. A record was kept of annual insect losses for 4 years preceeding the fire and for the 1924 and 1925 subsequent infestation. In addition, 3 permanent sample plots, representing 3 distinct types of burn were established and 2 1/2 miles of strip marked as a basis for determining per cent of recovery of trees in the five recognized classes of fire injury. A study is being made of the effect of fire injury upon growth rate as it is apparent that it is the sudden checking of the growth, after defoliation by fire, rather than the attraction of the scorching that renders these trees especially susceptible to bark-beetle attack.

The preliminary analysis of the results of this study are now being worked up and a second survey will be necessary during the 1927 season to complete the study.

Regional Survey of Insect Damage (RS, Pi-7)

Satisfactory progress can be reported on this important project. It will require a special assignment which cannot be provided for out of the present personnel to carry this project through to completion.

OFFICE OF FOREST PATHOLOGY

E. P. Meinecke, Pathologist

The policy to work up accumulated data rather than to continue in the accumulation has been followed during the past years as far as curtailment of, and changes in, the personnel have permitted. Most of the material has now been sifted, tabulated and brought into shape for actual use.

CURRENT PROJECTS

Cull in Virgin Timber

Sugar Pine and Yellow Pine (RS, Pd-5)

Data from the Stanislaus National Forest (Standard Lumber Co. Sale) collected in 1925, together with those from former studies have been combined to form a reasonably safe basis for cull per cents over ages. They are now available in form of curves. The cull per cents are based on Forest Service scale and are immediately useful, therefore, only for the appraisal of stands on the basis of present day utilization. The high intrinsic value of sugar pine and yellow pine does not permit the independent cutting of large numbers of individual trees for a detailed and accurate analysis.

White Fir (RS, Pd-2)

The field data accumulated have been worked up and are now available in form of curves showing the rate of decay in relation to age and also the relation of the rate of decay to position of the timber within the commercial range of the species.

Incense Cedar

The field data are completely worked up and presented in curves showing rate of decay in relation to age and in relation to position within the commercial range.

Cull in Young Timber

While studies in the field primarily favored the older age classes sufficient material is at hand to judge the presumptive rate of decay in young stuff. This is particularly true for white fir and incense cedar for which the curves of rate of decay give an

indication of cull to be expected in the coming forest. In sugar pine and yellow pine which could only be studied on timber sales in the merchantable sizes, it is highly desirable that dissection studies independent of timber sales be conducted. In case the present unfavorable situation with regard to funds and staff is remedied such studies could be inaugurated in 1927 and 1928. Management of second growth rests upon an insecure basis as long as the net volume to be expected is unknown.

Slash Disposal Study, Stanislaus (RS, Pd-4)

The slash disposal experiment under intensive fire protection was begun in 1923. The plots have been examined in 1924, 1925, and again in 1926. The study is under the shadow of two unfortunate factors. The winter of 1923-24 was exceedingly dry and mild and the snowfall was so light as to have no compressing and flattening effect on the piles, and fires destroyed some of the valuable plots. Taken as a whole, disintegration is still proceeding rather slowly. The plots will be examined again in 1927.

Effect of Killing Diseases on Reproduction (Rs, Pd-6)

A manuscript entitled "The Evaluation of Loss from Killing Diseases in the Young Forest" has been submitted for publication. The study of the effect of killing diseases on density in relation to age and site begun with Crenartium comundrae on yellow pine is to be continued if funds permit. It is planned to concentrate on Cronartium comandrae on account of its relationship to the white pine blister rust and on mistletoe in yellow pine and Monterey pine.

Mistletoe in Second Growth Yellow Pine (RS, Pd-7)

This study, begun on the Plumas in 1920 and interrupted during 1924 and 1925 on account of lack of funds and personnel, has been revived in 1926 with interesting results. The Plumas plots of young growth, some of which had been carefully cleaned of all mistletoe infections, were re-examined this year and further examinations will be made in the next years of the purpose of determining the rate of re-infection. New plots have been laid out on the Lassen. In 1926 an attempt was made to establish by actual count the number of berries produced by individual female plants of mistletoe. The results were surprising. While some plants were sterile others ran to over 4000 seeds per individual plant. Old plants must run well over 10,000 berries. Since individual trees may harbor as many as 300 or 400 mistletoe plants the number of seeds thrown out annually onto nearby yellow pine reproduction must be enormous. It is intended to follow this angle of the study in 1927, amplifying it with phenological observations.

Effects of Foliage Reduction

As a preliminary to the study of the effect of continued reduction of functioning leaf surface through leaf diseases, drought, etc., a number of yellow pine saplings at the Feather River Experiment Station were partly defoliated in 1924. The effects of this defoliation observed in 1925 and 1926 were so pronounced that new studies of a similar type are contemplated for 1927.

Effects of Drought

The sporadic dying of trees in the forest due to excessive drought which was so pronounced in 1924 has been observed to a much lesser degree during the season of 1926 which was preceded by a dry winter ending with torrential rains in April.

The drought of 1924 is clearly expressed in the stunting of the needle growth of that year in sugar pine, yellow pine, Douglas fir and white pine. A large number of measurements of needle length and diameter, of length of annual growth of the main stem and of distribution of foliage of the stem in yellow pine saplings has been made and the results are now being tabulated. The study is to be continued if funds are available.

NEW PROJECTS

Relation Between Logging Injury and Decay

Neither funds nor personnel were available during 1926 to carry out a study of this type with any measure of success. It does not lend itself to the purely observational method but demands considerable axe work and analysis in the field. It is hoped that this important study can be financed in the near future.

Frost Injury in Douglas Fir

Late frost often has a serious deforming and growth retarding influence. Mr Wagener has begun a study at the Feather River Experiment Station of the elements entering into the phenomenon particularly with regard to the influence of topography and of the immediate surroundings of the individual, to extent of damage, to the question of after-effects. The study is to be extended to a general survey of frost belts and frost holes and their bearing on Douglas fir reproduction.

OFFICE OF BLISTER RUST CONTROL

S. N. Wyckoff, Pathologist

The Office of Blister Rust Control is conducting three major projects dealing with the local control of white pine blister rust in District 5.

Experimental Ribes Eradication

This project is properly divisible into two subprojects, eradication by means of hand-pulling of bushes, and eradication by application of toxic chemicals.

Experimental Eradication by Hand-pulling

Purpose: To develop methods of protection of sugar pine from white pine blister rust by means of eradication of wild Ribes, which will be applicable to forestry conditions in the sugar pine types.

During 1926, the following results have been secured:

Location of experimental area: Stanislaus National Forest, all or part of Sections 20, 21, 28, 29, 30, 31, 32, Township 4 N., Range 18 E., Mt. Diablo Meridian. This area contained a high percentage of sugar pine type and also four species of Ribes, Grossularia roezli, Ribes nevadense, R. hallii and R. cereum.

Results of work: The following table gives the results of this experimental work, in terms of eradication types and costs. An eradication type is an area representing sufficiently uniform conditions so that a given method of Ribes eradication is used.

Experimental Ribes Eradication, California.

Eradication Type	Ribes per acre: G. roezli	R. nevadense	R. hallii	Total	Acreage Worked	Cost per acre
South Exposure Mature	7	-	-	7	430	$ .30
South Exposure Cutover	37	-	-	37	346	1.99
North Exposure Mature	26	3	-	29	793	1.52
North Exposure Cutover	149	2	-	151	144	3.64
Stream Mature	54	65	-	109	301	4.54
Stream Cutover	458	46	-	504	87	7.89
Brush	67	10	1	78	548	3.88
Thicket	½			½	125	.09
Mixed	16	1	-	17	135	.62
Totals and Averages	50	9	-	59	3134	$2.22

The efficiency of this work by number of bushes was determined by strip checks to be 92.35 per cent. Efficiency by feet of live stem or potential infecting power was found to be 96.97 per cent.

Proposed Work for 1927: During the field season of 1927, it is planned to conduct a similar experiment, on a somewhat increased scale, in the same locality.

Experimental Eradication by Application of Chemicals

Purpose: To develop chemical methods of Ribes eradication which may be cheaper and less expensive than hand-pulling. It is expected that this method of eradication will be particularly applicable in areas where Ribes growth is most profuse.

Location of Experimental Areas: This work has thus far been conducted only in Idaho.

Results of Work: Results to date indicate that R. petiolare, an Idaho species, and probably other species, when they occur in great numbers can be eradicated by application of chemicals more cheaply and efficiently than by hand-pullibg. This has been found to be especially applicable to stream type.

Proposed Work for 1927: It is proposed to conduct a small experiment on chemical eradication of Ribes on the Stanislaus National Forest. This will be in conjunction with the experimental work on hand-pulling of Ribes.

Reconnaissance

The Office of Blister Rust Control plans to conduct an extensive reconnaissance of sugar pine areas to determine the average density of the Ribes flora in the various eradication types, and the general occurrence of these types.

Purpose. To secure information for the development of a general plan for application of local control of blister rust.

Results of Work. During 1926, a small start was made on this project, 9,440 acres being reconnaissanced in the immediate vicinity of the Ribes eradication camp.

Proposed Work for 1927. During the coming field season it is planned to extend this reconnaissance. It is hoped to cover a sufficient number of representative areas on the Stanislaus National Forest so that a general conception of local control working conditions on the entire forest will be developed.

The utilization of Forest Service records on the location and amount of sugar pine timber and reproduction constitutes a necessary b sis for field work by this Office. The further assistance and cooperation of the Forest Service in supplying us with these data will greatly facilitate our work.

Studies in Ribes Ecology

In addition to the experimental work on Ribes eradication, studies are being conducted on the occurrence, habits of growth, means of seed dissemination and factors influencing establishment and survival of Ribes seedlings.

Purpose. (1) To assist in development of methods of Ribes eradication, and (2) to determine the feasibility of the elimination of all or most of the Ribes in the sugar pine types by indirect means. Investigations to date indicate that well stocked timber stands contain fewer Ribes than understocked stands. They also indicate that the opening up of a stand by logging results in an immediate increase in the formation of seeds by the Ribes on the area, and that the exposure of the mineral soil by logging operations provides a seed bed favorable to the germination of these seeds and the establishment of the seedlings. Detailed investigation of these and other points may have, not only a profound influence on the Ribes eradication program, but may result in recommendations to the foresters of practices which, while not contrary to recognized silvicultural practice, may greatly aid in eliminating or keeping to a minimum the growth of Ribes within the sugar pine type.

Results. The 1926 field season has principally shown the need for such studies. A study of Ribes conditions has been made on the Cow Creek permanent sample plot, on the Stanislaus National Forest. Other plots were established to study percentage of survival of Ribes seedlings.

Proposed Work for 1927. It is proposed to develop this investigative work as rapidly as the definite need for such studies is recognized.

Further Cooperation Desired From the Forest Service

To serve as a basis for the formulation of plans for application of blister rust control, this Office is in great need of a careful and accurate inventory of all sugar pine areas, a determination of their potential sugar pine productivity, and a consequent decision as to which of these the owners desire to maintain as sugar pine producing areas. We fully realize that this is a large job, but we look to the Forest Service to assume the leadership. In order to meet this situation we feel that the Forest

Service should carry to completion as rapidly as possible a careful delimitation of the areas which they wish to permanently develop as sugar pine type, and studies on rate of growth of sugar pine which will make possible the prediction of yield of this species from reproduction stands of various ages, density and composition. Such studies will not only constitute a sound basis for application of local control on the national forests, but will also exert a beneficial influence on the development of local control outside the national forests. The need for such studies is very great, and this office most earnestly recommends that they be undertaken at the earliest possible moment.

(The Investigative Committee recommended a conference between Mr. Wyckoff, Mr. Show and Mr. Woodbury to determine what can be done by the Forest Service to assist in orienting future control work.- Ed. note.)

OFFICE OF GRAZING

J. W. Nelson
Assistant District Forester

The status of grazing investigations in the District has changed but little in the past few years. The research work undertaken so far has been carried on mostly by special grazing men incidental to their other work. The very pressing problems of grazing administration have left little time for investigative work other than that necessary to meet the immediate needs of administration.

The status and needs for grazing investigations was fully covered in Mr. Nelson's memorandum to the Committee in 1924. Since that time the California Forest Experiment Station has been established and much of their work of a fundamental nature should yield considerable material of value in grazing work.

In certain respects grazing policies in the past have been based upon assumptions and general conclusions that have been reached in investigations conducted under conditions that have not been comparable to those found in this District.

The California District has climatic conditions that differ greatly from those in other localities where grazing investigations have been conducted. For instance, but five to fifteen per cent of the annual rainfall occurs during the summer months as compared with forty to sixty per cent throughout the Rocky Mountain region. This fact alone results in conditions of growth and vegetative requirements so different that a large amount of investigative work is urgently needed to give a reliable basis upon which to determine permanent policies.

The importance of watersheds does not need special discussion. They constitute one of the most important resources of the national forests in this District and it is highly important that the proper grazing use of these areas be known in order that they may be kept in the best possible condition.

Our present plans provide for a further study of the practical application of known principles to California conditions and an effort to conduct some actual investigation along this line. It will not be possible, however, to carry on this work with our present personnel to the extent that is necessary in order to get our grazing work tied into a scientific basis. It is hoped that through Congressional appropriation it will soon be possible to enlarge the work of the Experiment Station so that the needs

for grazing research may be properly met. In event such action can not be secured within the next few years, it is hoped that an increase in research funds may be secured sufficient to enable us to assign a grazing man to the Station's staff. It is felt that great value could be secured through such an assignment since we have available the able direction of the Experiment Station staff and several well qualified technically trained grazing men who would be able to cooperate in the work so that a fairly comprehensive program could be inaugurated immediately.

There is being constructed on a number of forests small enclosures for the better observation of range conditions. On the Sequoia Forest the reconnaissance party has established two such enclosures and a number of line transects. The latter are placed across the edge of meadows and used to tie into known points the forage plants of such areas since it is here that the first changes take place when overgrazing occurs. The need for enclosures is emphasized to the various Supervisors in connection with grazing administration. It is hoped to have two such enclosures on each ranger district in the state at an early date.

It was intended to experiment on the eradication of woolly pod milkweed on a sheep allotment on the California Forest last season, but due to the intense fire situation in the District no work could be done on the project. It now seems that sheep will be eliminated from the area, since it is the only place on any national forest in the state where serious losses are encountered from this species, therefore no further work will be done.

Assistant Range Examiner L. S. Smith has conducted a study on the Squaw Valley allotment on the Tahoe Forest in connection with one of their serious grazing problems. He has made some very intensive observations and analyzed all factors affecting forage growth and determined the effect of grazing upon the composition of the forage stand and upon forage production. This will be of value in the future administration of this and like areas.

Mr. Cronemiller's report on "The Effect of Fire on Forage in the Brush Fields of the California Forest" is in rough draft form but will need some revision on account of additional information to be incorporated with it. No doubt this report will be finished before the beginning of the field season.

No further work has been done on the project covering the effect of foxtail on the seasonal use of sheep ranges, but the findings of last year were put into practical application and have been proven correct. It was contemplated to continue this study and compare weights of shorn and unshorn lambs but due to the lack of weighing facilities this phase of the project had to be abandoned.

The section of range management of the U. C. School of Forestry is carrying two projects which this office is interested in. One concerns the management of annual grass range and the other covers forage species used by deer in Yosemite.

The Committee urges the assignment of an additional man for the Experiment Station, with broad fundamental training, to undertake ecological studies bearing on grazing, fire control, and forest influences. This assignment should be given priority in the first increases made for the Station. The Committee suggested that a preliminary paper by Cronemiller on the present status of the deer study would be very desirable.

EDDY TREE BREEDING STATION

Lloyd Austin, Director

Mr. Austin did not have his report in manuscript form.

Briefly, the aim is to develope a rapidly growing timber species producing high quality wood adapted to moderate elevations. The belief is that private afforestation will be confined in the future to the better sites.

Work is being concentrated on species of Pinus. Some incidental work is being done with Juglans. Field selection of trees for breeding stock by observation has proved unsatisfactory because of the difficulty of evaluating the influence of local environmental variables. The new policy is to base selection on progeny tests. Considerable pollination is being done to establish parentage.

OFFICE OF FOREST PRODUCTS

INVESTIGATIONS IN FOREST PRODUCTS AND FOREST ECONOMICS

C. L. Hill, Chief of Office.

REPORT FOR 1926

The chief criticism of the work of this office in the past has been that we were endeavoring to cover too many activities. A number of circumstances, including hang-over projects inherited from the past and the very heavy volume of inquiries from the public received by this District Products Office have made concentration of effort very difficult. This year, however, a special effort was made to this end. The process was also emphasized by limitations consequent upon complete change in the personnel of the office, other than the Chief, during the course of the year. Unfortunately, this enforced curtailment prevented a realization of corresponding benefit in increased accomplishment on remaining work. It will explain, however, the omission of activity in some lines of work included in the following discussions.

The organization of the following discussion is in accordance with the writer's understanding of the instructions in Branch of Research letter, R, Investigative Program, of December 10, 1926.

The following list of projects is substantially in the order of last year's report.

Going Projects, Forest Products Investigations

Lumber Seasoning Projects

1. Air Seasoning. This matter as an experimental project was listed as closed in last year's report. In order to facilitate the preparation of a desired bulletin on "The Seasoning of Western Softwoods", however, it became necessary in November for Mr. Hill to spend two weeks in a trip through the mills where project work had been carried on in this District, with Messrs. Fullaway and Gibbons from the Products Offices of D-1 and D-6, Respectively. This was primarily in order to give an acquaintance with our conditions to Mr. Fullaway who is to prepare the bulletin. Following this also Mr. Fullaway requested a large amount of special data on lumber seasoning in this region for his use in connection with the bulletin. Either the angle from which this information was organized, or the information itself, was so different from

that worked up as a result of our primary study as to make its preparation entail a large amount of work. The data should be completed by the end of January..

So far as now known the preparation of this information will again close this project.

2. Seasoning Survey. In spite of its desirability to the industry and to the Forest Service as applied to timber appraisal and the projected use of timber sale stipulations for raising the level of sawmill efficiency, this project was dropped for this year as being impossible to give priority under present limitations.

Future Plans. Cannot be undertaken until larger personnel is available.

Wood Preservation Projects

3. Marine Piling Survey. In spite of the best efforts to close this project during the year, the hoodoo of delays outside of the control of this office continued with it. The report, now, however, is going to the printer and the project will shortly be closed, except for continued inspection of material in exposure tests, as noted under the following project.

4. Wood Preservation Inspection. During this year it was possible to make only one of these inspections. This was of the Forest Service treated telephone line at Union Valley on the Eldorado National Forest, in respect to which information was desired which did not seem previously to have been brought out. The most interesting feature of this inspection for record here was that white fir poles have outlasted incense cedar poles, both being treated by the same Boucherie process. This is doubtless connected with the fact noted in the original installation that the white fir took treatment better than the cedar. It illustrates strikingly, however, the superiority of preservative treatment over natural durability in respect to decay resistance, and is also significant in respect to the question now important as to the possibility of obtaining satisfactory treatment of white fir.

Materials for desired test in marine exposure have continued during the year to be received from the Forest Products Laboratory. These have been, or will be, set in exposure along with the test material of the Marine Piling Committee, for whose continued inspection this office has undertaken the responsibility.

Future Plans. Inspection should be made during 1927 of several of the items above mentioned, as well as of certain ones remaining from the Products' experimental work of former years, including the piling material at Fort Mason, Pentrex treated

poles in the lines of the Pacific Gas & Electric Company, San Francisco, Southern Pacific ties, P.L.-34, and two Forest Service treated fence post lines of long standing. It is hoped that it may not be necessary during 1927 to have necessary inspections made by a Laboratory representative, as has had to be done in some past years because of our limited personnel. Such practice in any line of work appropriate to conduct by the District is exceedingly uneconomical to the research organization as a whole, since it adds to the cost of actually doing the work an amount of expense in transcontinental railroad fare, which would need only a few such items to pay for the additional technical assistant necessary to enable this District to carry its own share of the load.

Cooperative installation and service test of treated white fir railroad ties and power line poles which was last year projected and of considerable importance to the possible utilization of white fir will have to await increased personnel.

Utilization and Waste Projects

5. Little Used Species. The bulk of the very considerable amount of work done on this project during the past year has been upon white fir. Incidental information has, however, been gathered on incense cedar and Douglas fir whenever opportunity offered. Several progress reports have been submitted to the Laboratory as this is part of a general inter-district and Laboratory project.

The main outlines of the situation respecting white fir in this district are: Eastern market is growing and now may be said to be good as to quantity, so that no company having access to that market need fail to sell its white fir product. Effective advantage of that market, however, can only be taken by the large companies with far flung sales organizations. In the San Joaquin Valley, due to effective sales organization of the "Big Four" sawmills in the Mountain Pine Sales Agency, and the handicap on Douglas fir from the Northwest due to combined land and water shipment, white fir is thoroughly established in house dimension and other uses. In fact, it practically monopolizes the building construction field in retail lumber yards. It is being introduced in heavy mill construction and it is hoped that the ban upon it for that purpose by insurance underwriters may be lifted. Especially in sawmills tributary to the San Joaquin Valley also increased momentum is being gained by movement toward better utilization of the higher grades of white fir through manufacture of them in cheap interior trim, doors, etc. Elsewhere in the manufacturing industry white fir, C and Better, is often not segregated at all. In the Sacramento Valley and Southern California retail yards practically no white fir is found due to competition of Douglas fir under favorable freights from the Northwest and a prejudice

against white fir due chiefly to the fact that it has not been used in the past. The conclusion is indicated that one of the greatest limitations upon the bettering of white fir utilization and the realization of a better price for it is the competitive low price of Douglas fir and that the otherwise possible results in respect to the former probably cannot be achieved until the present ruinous conditions in the Douglas fir market and industry are fundamentally improved.

Future Plans. A final report combining findings made up to the present time was expected to be completed during January. The air seasoning computations and the new moisture content work must have right of way until at least the middle of March, which will compel the postponement of the white fir report. Information in respect to white fir will continue to be picked up as incidental opportunity may offer. It is believed that profitable project work in respect to white fir should now shift to questions of woods and mill practice as bearing upon utilization and waste.

6. Mill Scale Study. During October the office cooperated with Forest Management in a mill scale study at the Madera Sugar Pine Company. One interesting outcome was that the scale under run, of which the company complained, was largely due to their practice of cutting excess thickness to prevent skips in planing. Thickness measurements on several hundred green boards showed them to be cutting considerably heavier than standard practice.

Economics Investigations

7. Lumber Census. Work was carried through as usual on the 1925 biennial census.

Future Plans. Just as the calendar year closed came a suspension by the Comptroller of a reimbursement to our office from the Census Bureau, upon the result of which will probably hang the undertaking of future cooperation.

8. Lumber Distribution. The immediate value to the Forest Service of this statistical sheet, based upon figures compiled by the California Pine Association, is not deemed sufficient for its continuance.

Project discontinued. However, it develops that the Association has this month (January, 1927) computed its own results and compiled a rough draft master sheet, of which we can get the benefit by typing it and furnishing them with copies. The data given by this sheet on distribution by lumber grades, which is not

supplied by Census Form D, seems to warrant the cost of this copying for Forest Service record.

9. Lumber Prices - Mill. As for several years past, prices of representative grades of the species of the California pine region have been plotted from the current statistical sheets of the Association, and graphed after the close of the calendar year, for the benefit of the Forest Service and the Association.

Future Plans. Continuing project.

10. Stumpage Prices. Continuing project, combining census questionaire and special inquiry.

11. Major Uses of Wood. This project, to determine the kinds and amounts of wood used, by major groups, within the State, suffered severely by the sudden death during the year of Mr. Wm. C. Hodge, who had been carrying on the project. A large amount of data was gathered, through such channels as looked most promising, but Mr. Hodge's unexpected death occurred in the midst of the evaluation of the degree of accuracy and sufficiency of data. The loss of what he had in his head will require at least two or three weeks of reanalysis in order to appraise the significance of the results and it is impossible in advance of that to say what further work in this project should be done.

Laboratory Cooperation

12. Paint Test Fence and Moisture Equilibrium Test. These two really separate projects are here grouped because they are primarily Laboratory projects and require only incidental time from this District. The paint test fence requires at least one inspection per year, but this is intended to be made by a Laboratory representative and can be made without the presence of a District man unless that is found convenient. The moisture equilibrium samples, which are hung here in the Ferry Building, require monthly weighing. This is, however, done by the Products clerk except for occasional participation by a technical member of the office for inspection and report upon the condition of the coatings. The moisture content project would come under this cooperative heading, inasmuch as it was initiated by the Laboratory, but has been numbered on its own account among the district projects because of the material outlay of time required for the work which the district must do on it.

New Projects Started 1926

13. White Ants. Products activity in this direction was not contemplated last year but resulted from the sudden discovery of dangerous termite attack upon building construction at Pasadena. In respect to the question which has been raised, chiefly outside this district, as to the legitimacy or necessity of giving Products time to this matter, the following considerations seem pertinent. We give most thought to the lumber producing industry, because by and large it doubtless is the most significant factor for the attack on wood waste reduction. That others are significant enough to deserve attention is witnessed by the large past amount of Products work on wood preservation. The work on Marine borers is almost an exact parallel to the case of white ants. Here, then, is a source of destruction to wood, whose extent and severity if unchecked are likely to jeopardise the usefulness of wood in building construction over a region comprising two million inhabitants. As an item of wood waste this measures up in the same order of magnitude as the waste in the producing industry and seems to be quite as necessary a matter of attention when it takes, as here, the form of a critical emergency.

Future Plans. This matter has involved only about a week of time expenditure during this year, but will probably require somewhat more. A trip out here by Dr. T. E. Snyder of the Bureau of Entomology and Mr. Hunt of the Forest Products Laboratory is projected especially in relation to termite protective provisions in the Uniform Building Code now in preparation by the Pacific Coast Building Officials' Conference. Should Dr. Snyder be unable to come, as now is feared, they will rely on this office for much of their contact. In that event Mr. Hill and Dr. Meinecke will probably make a trip south for study of the situation and such service as they can render in securing the adoption in the building code of the combined Bureau of Entomology and Forest Products Laboratory recommendations. When viewed from the standpoint of success or failure in the adoption of such safeguards in a building code which will be used throughout the Pacific Coast, the contribution of another week or even two of time can hardly be withheld. Approved by Investigative Committee.

14. California Economic Research Council. This voluntary association, formed during the year, includes some 150 agencies of the State, engaged in the production or use of economic research information. Its objects are to provide an avenue for mutual knowledge of projects and results among such agencies and to stimulate and advance economic research and allied technical research by suggestion and by advisory activity looking toward correlation and standardization. The movement seems to have much potential

value. The work is under the general chairmanship of Dean W. E. Hotchkiss of the Graduate School of Business of Stanford University. Mr. Hill was asked to serve as chairman of the Committee on Natural Resources. That Committee was the first of the five standing Committees of the Council to present recommendations for Council approval. These covered two matters of concern to the usefulness of soil surveys and of general soils information in California and the prestige of Council approval evidently aided considerably in furthering the aims of soils work in the State. At the spring meeting of the Council it is hoped to be able to recommend a definite program for the extension and unification of snow surveys in California, and for the preparation and issuance of a climatic handbook for the State, both of which are greatly needed. Following these, if Mr. Hill maintains his present connection with the Committee, desirable forestry matters will be taken up. This work is rather exacting, taking as much as two days a month, occasionally more, which means approximately one month out of a year.

Future Plans. Fairly clear if continued. The Investigative Committee agrees that this work is of sufficient importance and the prestige of its guidance of enough value to the Forest Servive to warrant the considerable time expenditure required, although the latter could not be much increased without making necessary Mr. Hill's withdrawal from the chairmanship.

Proposed Projects 1927

15. Lumber Depreciation. This project, which it has been hoped to undertake for the past three years, had to be dropped as a part of program reduction for the past year, in spite of its urgent value to Forest Management work in this District, and the long-standing request of the Forest Management Office that it be undertaken.

Future Plans. The Investigative Committee agrees that even under present personnel limitations this project should be carried out in 1927. It will require at least one man-month ~~time~~.

16. Survey of Sawmill Practice. Due largely to specialized demands in past years, the office needs much more detailed information than it now has respecting many phases of sawmill operation and practice. Especially will this be necessary for effective study of waste in the sawmill, which fundamentally needs to follow, here as well as in other districts. Mr. Hill will cover as much of this as he can. Mr. Brundage during the spring will visit District 1, where such work is now in progress, in order to prepare for our detailed studies. Project approved by Committee.

17. Study of Waste in Logging. Such a study should aim to establish facts similar to those sought in such studies elsewhere. As a preparation for them Mr. Brundage will visit District 6 where such studies are in progress, in the spring. Such a trip, combined with that to District 1 on sawmill studies, will

take approximately four weeks, which will leave him this season not much more than the possibility of selecting locations and preparing thoroughly for a flying start next season. Project approved by the Committee.

Possible or Desirable Projects

Heptane Production. This is not a project definitely proposed for 1927, but represents possibly necessary work due to a sudden development of a special angle of the turpentine activity expected in former years. The situation is this: Professor Kremers of the University of Wisconsin has for years carried on chemical investigative work on heptane, which is obtained by tapping Jeffrey or Digger pines, similar to the obtaining of turpentine from the yellow pines. The only source of production has been old Dr. Freyer who has had a little operation on private land above Chaparral House on the Lassen National Forest. Due to combined small scale and inefficiency of operation, the product has cost about $25. per gallon. The Bureau of Standards was for a time interested in the product as a possible measure of standard candle power, but the price was prohibitive. Very recently the Ethyl Gasoline Corporation has become interested in the possibilities of heptane in anti-knock compounds. They want perhaps 500 gallons for experimental work next year, but likewise consider $25. per gallon prohibitive. The only answer is to get a more efficient operator to undertake the supply. Negotiations have been started by this office with E. C. Shaler of Pasadena, who was in charge of our experimental turpentining work in this District in 1910-1912. He indicates that he might be interested if there were some guarantee for more than a single year. If it materializes it should be accompanied immediately by undertaking of joint investigative work by Products and the Experiment Station. Any considerable work by Products can be done only by displacing something already scheduled, probably the sawmill practice survey, serious as that omission would be.

Wood Using Industry Study. This office still believes, and the Investigative Committee concurs, that the best tactical order in which to carry on waste studies is for studies of the possible uses for waste in the wood working industries to precede rather than to follow studies of the production of waste in either woods or sawmill. As a matter of practical feasibility, however, the former studies are least able to be undertaken with present limitations and must be postponed until larger personnel is available.

Market Studies. Such studies of the current requirements of strategic market centers, in quantity, species, grade and form of lumber and other wood products, have been desired for several years because of their importance to the District "Economic Study" and to national forest timber management plans. Certain studies were planned for 1926 but were dropped in the effort to reduce our program.

Future Plans. In spite of their desirability these studies must await increased personnel resources.

Brief Statement of Research Work of the Division of Forestry, University of California, to be pursued in 1927.

Professor Walter Mulford.

Silviculture

The studies in this field will embrace careful consideration of fundamental factors underlying natural reproduction. A detailed laboratory, greenhouse, and field study is outlined under Project 813. The work in 1927 will embrace observations as to the reaction of native timber trees of the seedling stage to direct radiant heat and the development of root system of selected species grown in soils of different edaphic conditions. In later years a study of germination and development of seedlings under different conditions of soil and atmosphere is planned.

Mensuration

A study of stem form of Douglas fir based on from 500-600 taper measurements will be made on individual trees from a series of age classes and site qualities. These data are expected to throw much light on form and form variation of the younger Douglas fir trees.

A study of Douglas fir in even-aged stands will also be pursued on from 100-200 sample plots accurately measured with a view to checking the suitability of Douglas fir yield tables for Oregon and Washington. These tables are constructed from sites in California.

Wood Utilization

Projects in wood utilization are designed chiefly to determine properties and uses of native California hardwoods. The wood-using industries of California are also receiving some study. Because of the absence of Professor Emanual Fritz during the calendar year of 1927, these projects will probably not be pursued.

Range Management

The range management studies are conducted under Project 720 under the general head of "Revegetation and Maintenance of California Foothill Ranges". The project embraces four subdivisions: (1) Range Improvement by Reseeding; (2) Range Improvement by Burning; (3) Nutritive Qualities of Distinct Forage Types and Food Stores Investigations in Roots as a Basis to Determining

the Effect of Grazing at Different Seasons; (4) Management of Deer on Typical California Ranges.

Protection plots and grazing tests are the methods pursued in the range revegetation studies. The burning of brush ranges embraces a study, where stockmen have burned the chaparral type which lies well below the true timber belts of succession, soil fertility, and comparative grazing capacity. The plant nutrient investigations are based on digestion tests with sheep and chemical analyses of forage and underground plant parts.

The study pertaining to the management of deer embraces a consideration of their food habits and life history.

Forest Management and Logging

Research activities in forest management and logging are included under Project 814 under the title "Factors Affecting Forest Management in California". The project embraces a consideration of time study of tractor logging. The cost of selective logging is included.

Editor's note: The Investigative Committee suggested that to prevent unnecessary overlapping a special conference be held by the Experiment Station and the School to correlate program.

APPENDIX

Project Sheets

RS
Mc-1
Feather River
Plumas
Sequoia
Shasta
Sierra
Stanislaus
Tahoe

January 24, 1927.

Management

Project — Methods of Cutting - Mixed Types

Purpose — The methods of cutting studies furnish a basis for judging the correctness of management and silvicultural practices on the national forests. The data serve as a guide for the modification of logging and marking regulations. The information is secured from permanent sample plots representing typical methods of cutting in stands of varying composition under different conditions of site. The results secured show, -

The net growth of the stand remaining after cutting and losses due to logging, slash disposal, windfall, insects, and other injurious agencies which reduce stand growth. The relative rates of growth of different species. The types of individual trees which grow best under varying conditions. The progress of restocking through stimulation of advance reproduction and reseeding. The best types of seed trees. The frequency of seed crops and amount of seed borne. The effects of cutting on changes in composition. Invasion by shrubs and herbaceous weeds.

Status — Approved by previous Committees and Forester. Twenty-four sample plots, varying in size from 6 to 25 acres, aggregating 287 acres, located on the Shasta, Plumas, Tahoe, Stanislaus, Sierra, and Sequoia national forests. Types represented: yellow pine - sugar pine, Jeffrey pine - white fir, sugar pine - white fir, and mixed conifer. The first three site classes are represented. The plots cover the shelterwood system, heavy selection, or seed tree cuttings, and light selection cuttings.

Diameter, height, and descriptive records kept for more than 20,000 trees. Records of seed bearing made for each tree. On major plots are 123 square chains of reproduction subplots. Eight square chains on the Plumas fenced. All the areas mapped, some in detail. Photographs taken at intervals to show changes.

Four plots established in 1910; ten in 1911; eight in 1913-14; one in 1921; and one in 1923. With the exception of four plots on the Sequoia, complete examinations have been made approximately every five years. The Sequoia plots were first reexamined ten years after establishment, but are now reexamined every five years. Most of the reproduction subplots have been reexamined annually.

All records compiled in permanent form on special Atlas size sheets. Progress reports prepared at five-year intervals for each plot. In 1923 a general summary of results was made in Dept. Bull. 1176. Periodical articles published on accoleration of growth after cutting, and methods of predicting future volumes in management plans. Results used as a basis for modifying marking rules and logging restrictions, and in growth predictions for management plans.

A survey and analysis of recent marking and a seed crop survey undertaken in 1926. The two Shasta plots were reexamined this spring. Compilation of 1925 progress report and tree class analysis nearing completion.

Plans

Continue reexamination at five-year intervals. New plots to be established to represent other sites, types and methods of cutting. In 1927 new plots will be established on the Strawberry unit, Stanislaus, and Fruit Growers' Supply Co. sale, Lasson, to represent recent modifications of marking and logging. Cooperation with Office of Blister Rust Control and Forest Management on Stanislaus. Stanislaus Plot 5 to be fenced.

Compilation of 1925 progress reports and tree class analysis to be completed. A second Department bulletin in process of preparation. A proposed tree classification scheme for selection stands nearing completion. Experimental marking board in 1927 to apply results. There is a possibility that some of the older plots on the Stanislaus and Plumas might be cut over again in the near future. If this is done half of the areas will be reserved for control. Paper on relation of logging damage to silviculture being prepared by Show.

Assignment

Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mc-101

Management

Project	Methods of cutting - Yellow Pine Type
Purpose	See Mc-1.
Status	Approved by previous Committees and the Forester. Two plots of 10 acres each established on Lassen National Forest in 1922. Reproduction strips also laid out and used for study of logging damage, new reproduction and development of advance reproduction. Cone counts on selected trees made annually. Work on old cuttings done by men on forests. Study of logging damage made on special plots.
Plans	Continue examination of strips and make cone counts. Another plot to be established on poor site quality to study relation of marking to bark beetle losses. Combine results with those from Mc-1. Date of completion indefinite. Reexamine in 1927.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Hr

Management

Project — Natural Reproduction.

Purpose — To determine the major factors controlling seed bearing, seed distribution, germination, and survival of natural seedlings as they affect silviculture, grazing, and protection.

Status — Approved by Committee and Forester in 1926. Considerable empirical data obtained from methods of cutting studies on rates of restocking. Some data obtained on seed crops and seed bearing of different tree types in methods of cutting study. Nursery and planting studies have furnished some data on quality of seed and survival. Two old plots on Stanislaus established to determine the effect of bear clover on reproduction. Report published by Munns. Reexamined in 1923. Strips established on Eldorado in 1921 to follow restocking after logging and fire, reexamined in 1923.

Plans — Working plan to be submitted for criticism to several men of experience in this work. Studies of seed supply to be continued on Mc plots. Inventory strips and sub-plots on Mc plots to be continued. Small amount of seedlings to be grown at Feather River for control planting. In spring of 1927 control seeding to be done under screens under various conditions, notably after removal of litter and bear clover during fire line construction on the Sierra and Stanislaus.

Assignment — Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mt-2

Management

Project	Thinning -- Even-aged second growth sugar pine - White Fir Type.
Status	Approved by previous Committee and Forester. One thinned plot and one control plot age 50 established on Stanislaus N. F. in spring of 1921. Reexamined spring of 1926. Progress report in preparation.
Plans	Remeasure plots at 5-year intervals. Lay out additional plots when possible. Date of completion indefinite.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mt-101

Management

Project	Thinning - Even-aged Second Growth Yellow Pine Type.
Status	Approved by previous Committee and Forester. Series of 14 plots, including controls, of various ages and on various sites established in 1919 and 1920 on Plumas N. F. Remeasured in fall of 1924. Data being compiled.
Plans	Continue measurements at five year intervals. Establish new plots on better sites when possible. Date of completion indefinite.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mt-161

Management

Project	Thinning - Even-aged Second Growth Douglas Fir Type.
Status	Approved by previous Committees and Forester. One thinning and one control plot established on Klamath N. F. in 1912. Remeasured in 1919 and 1922 and results of both put in manuscript form.
Plans	Remeasure in 1927 and every five years thereafter. Date of completion indefinite.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mt-167

Management

Project	Thinning - Even-aged Second Growth White Fir.
Purpose	To extend existing study of methods of thinning to pure white fir type.
Status	Approved by Committee 1927. Suitable stand of pure white fir examined in 1926 in eastern Lassen. Working circle convenient to transportation and Feather River center of work. Age about 65 years. Site III.
Plans	In 1927, if time is available two plots of 1/3 to 1/2 acre each will be thinned, one heavily, the other lightly. The permanent yield plot proposed under project ME-167 will serve as a control.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Mt-1

Management

Project	Slash disposal - Mixed Types.
Purpose	To compare piling and burning of all logging slash with disposal of slash only on strips. Effect to be studied from standpoint of costs, fire control, and natural reproduction. See also Pd-4 for pathological phases.
Status	Approved by previous Committees and Forester. Work begun in 1923 on Stanislaus N.F. Study of effect on reproduction unsatisfactory because plans not followed by forest force. Detailed record of fire control data and costs kept. Effect of burning piled slash studied by Lassen force and report in preparation.
Plans	Continue observations on Stanislaus area. Study of new area to begin this spring on Fruit Growers Supply Co. sale, Lassen. Yellow pine - white fir type, east slope conditions. A progress report will be prepared when data warrant.
Assignment	Wieslander, in cooperation with Forest Management and Forest Pathology.

January 24, 1927.

RS
ME-4

Mensuration

Project — Yield - Mixed Types.

Status — Approved by previous Committees and Forester. Work begun in 1920 and 183 even-aged plots measured in mixed types on west slope of Sierras. Preliminary report prepared, using height as index of site. About 135 additional plots since measured. Work in 1925 and 1926 aimed to determine relative space requirements of different species. Study of white fir yields made by Forest School in cooperation with Forest Service and results published. Study of red fir made by Forest School in 1926. Results being compiled. Further data on height growth and time to reach breast height made in 1926.

Plans — Work up data available. Continue to take plots to complete series. Continue study of stocking as affecting yields. Douglas fir to be studied in 1927 by Forest School in cooperation with Experiment Station.

Assignments — Dunning, Wieslander, Siggins.

January 24, 1927.

RS
ME-101

Mensuration

Project — Yield - Western Yellow Pine.

Status — Approved by previous Committees and Forester. Study of yield of even-aged stands made by Gallaher on west slope of Sierra in 1914 and 1915, and by Show on east slope in 1919. Results published. Work done in 1925 and 1926 to determine effect of different densities on yield by detailed mapping and analysis. Data partly worked up.

Plans — Continue study of stocking. Chief emphasis on method of application. Present plots to be worked over into a modern yield table on same site class basis, using same volume tables and technique. Date of completion indefinite.

Assignment — Dunning, Wieslander, Siggins.

January 24, 1927.

RS
ME-101 (Formerly included in ME-6)

Mensuration

Project	Permanent Yield Plots - Even-aged Second Growth Yellow Pine.
Purpose	To determine the development of natural even-aged stands at different ages on various sites as a foundation for yield tables.
Status	Approved by previous Committees and Forester. Permanent plot in pure 30-year old yellow pine, Shasta National Forest, established in 1918, remeasured in 1923 and results reported. Permanent plot in 54-year old yellow pine established on Plumas National Forest in 1919. Remeasured 1924. Progress report prepared. Additional permanent plots have been established as controls for thinning experiments (Mt-101).
Plans	Establishment of additional plots from time to time. Remeasured at 5-year intervals. Date of completion indefinite.
Assignment	Dunning, Wiesłander, Siggins.

January 24, 1927.

RS
ME-161 (Formerly included in ME-6)

Mensuration

Project	Permanent yield plots - Even-aged Second Growth Douglas Fir.
Purpose	To determine the development of natural even-aged stands at different ages on various sites as a foundation for yield tables.
Status	Approved by previous Committees and the Forester. One plot established in a 50-year-old stand of Douglas fir, Site II, on the Tahoe in 1923. Control plot for project Mt-161 serves same purpose.
Plans	Establish additional plots from time to time. Remeasure at 5-year intervals. Date of completion indefinite.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
ME-167(Formerly included in ME-6)

Mensuration

Project	Permanent yield plots - Even-aged Second Growth White Fir.
Purpose	To determine the development of natural even-aged stands at different ages on various sites as a foundation for yield tables.
Status	Approved by previous Committees and the Forester. One plot established in 75-year old stand of white fir, Site I, on the Stanislaus in 1923.
Plans	Establish other plots from time to time. In 1927 one more plot will be established on the Lassen, Site III, in a 65-year old stand which will also serve as a control plot for project Mt-167.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
ME
Volume Tables

Mensuration

Project	Volume Tables.
Status	Approved by previous Committees and Forester. All available yellow pine volume data for D-5 has been regrouped and analyzed and new tables on site quality basis constructed for Sites I, II, and III and put into general use. New data for Site IV secured on Modoc National Forest in 1923. Data for white fir and sugar pine furnished Professor Bruce as basis for studies of volume on site basis. White fir study resulted in first series of tables on site basis. 1602 new trees measured in 1924, including Sites I, II, III sugar pine and white fir, Sites IV and V yellow pine, and Site II Douglas fir. Tables prepared for sugar pine, Sites I and II. Site III white fir table revised. Preliminary Site IV table made for yellow pine. All volume table data for western yellow pine from six western districts has been secured, sorted into locality and site groups, and forwarded to Washington for necessary computing. Material has been secured and set of volume tables for second growth timber of yellow and sugar pines, Douglas and white firs, and incense cedar constructed. 40 additional Douglas fir trees measured in 1924. Work on regional study continued in Washington. Douglas fir data submitted for similar study. New data for second growth Douglas fir secured from Tahoe in 1926. New Site IV yellow pine data secured from Stanislaus and Modoc in 1926.
Plans	Obtain additional data for second growth incense cedar. Advisory help on new tables for general use to continue. Revise second growth Douglas fir table. Date of completion indefinite.
Assignment	Dunning, Wieslander, Siggins.

January 24, 1927.

RS
Pf, A-1

Fire

Project — Damage.

Status — Approved by previous Committees and Forester. Detail studies begun in 1911, and continued and expanded to present. Results to date used in Dept. Bull. 1294 "Role of Fire in the California Pine Forests" by Show and Kotok, which was widely distributed during 1925. A short edition "Fire and the Forest" was published and distributed. Permanent plots to study damage to individual trees are on Klamath, Modoc, Lassen and Plumas National Forests. A permanent plot to study effect of repeated summer fires on forests, restocking brush-fields and chaparral was laid out and burned in 1920 on the California N. F. Annual examinations are made on it. In 1925 the plots on the California and Plumas National Forests were examined. An additional area was established on the Plumas N. F. by the timber survey crew in making a fire damage appraisal.

Plans — Install new plots as rapidly as possible. Continue examinations of existing plots. Date of completion indefinite.

Assignment — Kotok.

January 24, 1927.

RS
Pf, A-3

Fire

Project — Rating of Hazard.

Status — Approved by previous Committees and Forester. Paper by Show and Kotok "Forest Fires in California", published as Dept. Circ. 343. Application of results to local administrative plans and practice started in 1921 on Shasta N. F. and since extended to the other important fire forests in the District. Preliminary analysis of fires in relation to cover type completed for about 13,500 fires. Analysis of elapsed time records made each year as basis for improving administrative practice. Show and Kotok served on northern California Board of Fire Review for six weeks, seasons of 1924, 1925, and 1926. Short analysis of 1924 season prepared and submitted by Dunning. Material progress made in analyzing fire occurrence and spread in relation to cover type.

Plans — Complete study of hazard and liability in relation to cover type. Make complete analysis of data for 1921-25 to supplement earlier work. Project continuous.

Assignment — Show and Kotok.

January 24, 1927.

RS
Pf, B

Fire

Project — Study of going fires.

Purpose — Preliminary studies by Operation and the Special Boards of Fire Review have clearly shown great diversity of methods in strategy and tactics in the handling of fires. One purpose of the study is to check on the grounds methods of strategy and tactics in relation to humidity, wind, cover and topography. An additional purpose is the development of a sound technique in measuring and evaluating the major factors which influence spread of fires and their suppression (See Pf, B-5).

Status — Approved by Committee 1927.
Valuable data has already been collected by the Boards of Fire Review in 1924 and 1926, which can be correlated with the study.

Plans — A minimum of two or three going fires will be studied and the following factors will be considered:

1. Meteorological -
   Several stations will be established around and as close to the fire as possible. Humidity, wind movement and temperatures will be taken.
2. Rate of spread -
   The successive stages of the spread of the fire will be mapped, showing character of cover and time of spread.
3. Topography -
   A topographic map will be prepared after the fire.
4. Cover types and fuel.-
   A type map showing these will be made.
5. Suppression methods -
   Every line built, every natural barrier will be shown together with its width, depth, closeness to fire, time of construction, etc. Every break will be analyzed.
6. Conclusions -
   All the data will then be assembled and studied.

Assignment — Kotok, Price, Gray.

January 24, 1927.

RS
Pf, B-1

Fire

Project	Lightning Fires.
Status	Approved by previous Committees and Forester. Observations from mountain lookouts on occurrence of lightning storms begun in 1921 and continued to date. Data secured during 1921-1923 analyzed by B. C. Goldsmith, but considered inadequate for more than preliminary conclusions. Several short papers on lightning storms and on characteristics of lightning fires published. More complete data obtained in 1925 and 1926 being assembled for machine tabulation in Washington.
Plans	Continue collection of data. Bring analysis of existing data to date. Completion indefinite.
Assignment	Kotok and Show.

January 24, 1927.

RS
Pf, B-4

Fire

Project — A study of foothill fires in northern California and the Sierras.

Purpose — We know little in detail about the behavior of fires in the foothills or the damage that follows. Fires in this region are a serious threat to successful protection of the timber belt. We must know more definitely how rapidly such fires spread and what damage follows to develop a sound state policy of fire control.

Status — Approved by Committee in 1927.
The "Role of Fire in the California Pine Region", by Show and Kotok, and Report to the Legislature on Senate Concurrent Resolution No. 27", by Munns, have given some consideration to this subject.

Plans — Actual study of some going fires to determine rate of spread in relation to meteorological, cover and topographic condition will be made as outlined in Pf, B. A survey of fires during the 1924 to 1926 season will be made from records in the State Forester's office and on the ground, particularly to determine damage factor.

Assignment — Kotok.

January 24, 1927.

RS
Pf, B-5

Fire

Project	Weather and Fuel Relationships.
Status	Approved by previous Committees and Forester. Collection of data on wind movement begun in 1913, on evaporation in 1920 and on humidity in 1924. Results to and of 1923 published as U.S.D.A. Circ. 354 "Weather Conditions and Forest Fires in California" by Show and Kotok. Observations continued during 1925.
Plans	Continue data on evaporation and relative humidity. Extend to temperature and precipitation as rapidly as possible. Continue cooperation with Weather Bureau. Completion indefinite.
Assignment	Kotok.

RS
Pf, C

January 24, 1927.

Fire

Project — Study of effectiveness of fire fighting equipment.

Purpose — To determine what tools are best for various types of cover; effectiveness of special equipment, and new tools devised.

Status — Approved by Committee in 1927.
Few checks have been made of the comparative values of different fire fighting tools used in doing the same class of work. For example, what is the comparative value of axes vs brush hooks in different cover types; where can horses and plows be used; what is the place of the tractor, the pump, etc.

Plans — Make actual time checks in different cover types to determine ease of line building and costs involved.

Assignment — Kotok, Price.

January 24, 1927.

RS
Pf, C-3

Fire

Project	Controlled Burning.
Status	Approved by previous Committees and Forester. Permanent experimental area of 200 acres laid out on Plumas N. F. and burned in 1919 and again in 1920. Part reburned in 1924. Data to date used in Dept. Bull. "Role of Fire in the California Pine Forests". Control area - unburned - examined each year to judge effect of fires on insect epidemics. Areas last reexamined in 1925.
Plans	Reburn in 1927 and continue examinations. Areas light burned by Diamond Match Co., Lassen N. F. in mixed second growth, to be studied if time available. Completion indefinite.
Assignment	Kotok.

January 24, 1927.

RS
Pf, C-4

Fire

Project — Study of fire breaks and fire lines.

Purpose — To determine the best location of fire breaks and fire lines, the most effective width and use in controlling going fires.

Status — Approved by Committee in 1927.
Many miles of fire breaks have been built in southern California. A fire line system was begun along the Sierra and Sequoia in 1912. Construction of new fire line is now proceeding on a large scale in the south. The data as to the cost and effectiveness of such lines have never been collected or correlated.

Plans — The history of all fire breaks in southern California and the Sierras will be gone into; their effectiveness on actual fire control will be studied from the records of past fires, etc.

Assignment — Kraebel, Kotok.

January 24, 1927.

RS
I-1, Angeles

Influences

Project — Relation of Brush Cover to Stream Flow.

(Project sheet will be submitted at a later date.)

January 24, 1927.

RE
Social Development

Project — Economic Study.

Purpose — To determine the relation of the forests of California to the population, so that where not inconsistent with their functions, the national forests may be so handled that local needs will be adequately provided for. See RE, Supervision, D-5, Investigative Program letter of 8/16/20; Annual Investigative Report for 1919, page 59; original plan of work, by C. DuBois.

Status — Approved by previous Committees and Forester. Work started in 1919 and approximately 1-1/2 man years devoted to showing on maps:

1. Present population
2. Agricultural lands in three quality classes
3. Stands of public timber
4. Existing transportation facilities

Work completed on 1 and 3 above. Study dropped in 1920 due to lack of funds. Data so far assembled have been in constant demand and use. Show practically completed agricultural land map, assisted by R. W. Ayres and prepared preliminary estimates of future population both agricultural and rural. Some data were obtained on wood demands for different crops but much remains to be done on this. Data on yield possibilities of timberlands, though not complete, are fairly adequate. Little work possible in 1925. Considerable work done on wood use study by Hodge, interrupted by his death. Land use map of state begun with mapping types. Revision of national forest type maps undertaken in 1926. 55 townships outside national forests mapped by Wieslander and Siggins, aided by state rangers. Data on private land secured from Diamond Match, Red River, and Southern Pacific companies.

Plans — Complete agricultural land and future population phases as soon as wood use study (see Products program) is done. Complete state type map for publication in 1927, if possible combining with agricultural land data.

Assignment — Show, Hill, Wieslander.

January 24, 1927.

S
Supervision

Management

Project	Logging damage on timber sales.
Purpose	Determination of extent and source of damage to reserve stand and advance growth with view to proper regulation of falling and power logging.
Status	Not previously projected. Formerly carried under RS, Mc-1 and minor administrative studies. Approved by Committee 1927. Considerable data collected in methods of cutting study 1911-1925, and Public Requirements Study 1921. Results included in Bulls. 1176 and 1402. Study of donkey logging on Klamath by Berry in 1921. Study of tractor logging, Plumas, by Price, and Berry in 1925. Study of tractor logging on Lassen by Berry, 1926. Study of tractor logging on Tahoe by Dooley and Barnum, 1926. Preliminary study of donkey logging on Sierra by Pemberton, 1926. Results of Price and Berry's study on Plumas published in Timberman. Reports on other studies in manuscript.
Plans	Tractor and donkey logging to be studied on Stanislaus in 1927. Minor studies by forest personnel to continue. Further data to be collected on new methods of cutting plots by Experiment Station. Informal conferences with sales administrators and lumber company officials in 1927 to get results into practice.
Assignment	Forest Management in cooperation with the Forests and the Experiment Station.

January 24, 1927.

RS
Pi-1

Project — Barkbeetle Control.

Status — Examinations and an analysis of the results of western pine beetle control work on areas of the Southern Oregon - Northern California project by F. P. Keen and on the tract of the Long Bell Lumber Company in southern Oregon by J. E. Patterson. A study of results obtained from control measures against the mountain pine beetle in lodgepole pine on the Crater National Park including a test of the solar heat treatment of infested logs was also made by Patterson. Results of these studies are available in preliminary manuscript reports.

Study of the biological factors affecting results of artificial control work by Person at Northfork, Cal.; life history work on predatory insects with reference to periods when these are destroyed by artificial control measures, and the effectiveness of certain predators in producing mortality of barkbeetle broods.

Plans — Further surveys to determine results of control projects carried out during the 1926 season, mainly on Area 1 of the Southern Oregon - Northern California project; results of 1926 control operations against D. monticolae infestations in lodgepole pine on the Crater National Park; continuation of Person's predator studies at Northfork. Date of completion indefinite.

January 24, 1927.

RS
Pi-2

Project	Elimination of Insect Loss through Marking.
Status	A series of experiments at Northfork by H. L. Person to determine the resistance to western pine beetle attack of trees showing certain growth characteristics. A permanent sample plot of 80 acres established on the Sierra National Forest giving detailed records of the crown, bark and growth characters, site, exposure, and soil conditions for 1500 individual trees over 8 inches D.B.H. An analysis will be made of tree selection by the western pine beetle from these records.
Plans	Continuation of experimental work following up the more important leads developed by work of the 1926 season. Selection of sale areas to try out a sample marking will be made as soon as suitable area can be located. Date of completion indefinite.
Assignment	H. L. Person.

January 24, 1927.

RS
Pi-3

Project	Interrelation of Insects and Slash.
Status	A manuscript by J. E. Patterson dealing with the effects of right of way slash in southern Oregon has been approved for publication as a Departmental bulletin to be issued during the coming year. A field study of the infestation resulting from the 1923 windfall on the Mono and Inyo National Forests was carried out during 1926.
Plans	Observations on logging areas on the Sierra National Forest and further study of the Mono-Inyo windfall situation. To be completed in 1927.
Assignment	J. M. Miller, H. L. Person.

January 24, 1927.

RS
Pi-5

Project	Drought in Relation to Insect Epidemics.
Status	Data now on hand was added to by records obtained in the survey of the Modoc National Forest where a study was made of the relation of soils to effect of drought and insect epidemics. Analysis of data incomplete awaiting large number of core measurements.
Plans	Correlation of data now available. Date of completion indefinite.
Assignment	F. P. Keen.

January 24, 1927.

RS
Pi-6

Project	Relation Between Insects and Fire Damage.
Status	Manuscript covering results of preliminary studies to appear in early issue of the Journal of Agricultural Research. Complete survey of the 1924 Northfork burn and a reexamination of sample plots and sample strips in 1926. Preliminary report about completed.
Plans	Re-examination of Northfork burn and sample plots during 1927 season and completion of final report.
Assignment	J. M. Miller, H. L. Person.

January 24, 1927.

RS
Pi-7

Project	Regional Survey of Insect Damage.
Status	No additional work on the project during past season.
Plans	Additional personnel necessary before progress can be made on this project. Date of completion indefinite.
Assignment	J. M. Miller and Experiment Station Force.

January 24, 1927.

RS
Pd-2

Project	Cull Per Cent in White Fir.
Purpose	To determine role of decay and its bearing on utilization and management.
Status	Work begun in 1911, and preliminary results published. Work in 1925 was cruise of white fir on Modoc and Plumas National Forests as basis for deciding changes in present marking practice. Results compiled in form of curves showing relation of decay to age, size, and distribution within commercial range of species.
Plans	Extend study when funds are available.
Assignment	E. P. Meinecke.

January 24, 1927.

RS
Pd-4

Project	Slash Disposal.
Purpose	To determine rate of decay of slash of different species, in piles or scattered.
Status	Experimental piles established on Stanislaus N. F. in 1923 (see also project Mb-1). These piles examined in 1924, 1925 and 1926. Some loss of piles in 1924 and 1925 by fire. Additional piles put up in 1924.
Plans	Inspection in 1927. Completion indefinite.
Assignment	E. P. Meinecke.

January 24, 1927.

RS
Pd-5

Project	Decay in Yellow and Sugar Pines.
Purpose	To determine loss from decay in trees of different ages and sizes, and in the stand as a whole.
Status	Besides older data, the information resulting from studies in 1924 and 1925 on the Stanislaus N. F. have been compiled and results are available in the form of curves.
Plans	Study to be continued as funds permit.
Assignment	E. P. Meinecke.

January 24, 1927.

RS
Pd-6

Project	Reproduction Rusts.
Purpose	To determine type and amount of loss in young stands of yellow pine and consequences of the damage.
Status	Detailed plots studied on Shasta N. F. in 1923. Results described in manuscript, "The Evaluation of Losses from Killing Diseases in the Young Forest", submitted for publication.
Plans	Additional studies on other fungi as funds are available.
Assignment	E. P. Meinecke.

January 24, 1927.

RS
Pd-7

Project	Mistletoe in Second Growth Yellow Pine.
Purpose	To determine rate and distance of spread of mistletoe as a basis for marking.
Status	A permanent plot on Plumas N. F. laid out in 1920 and mistletoe eradicated. No examination made 1923-1925. Reexamined in 1926. New plots established on Lassen in 1926.
Plans	Study continues.
Assignment	E. P. Meinecke.

January 24, 1927.

RS
Pw

Project	Frost Injury in Douglas Fir.
Purpose	To determine the extent of deforming and growth retarding influence of frost with special reference to the influence of topography and immediate surroundings.
Status	Review of literature and assembling of meteorological data begun. Observations in vicinity of Feather River Experiment Station commenced in January.
Plans	Observations to continue at Feather River. Study to be extended to a general survey of frost belts to determine bearing on Douglas fir reproduction.
Assignment	W. W. Wagener.

January 24, 1927.

RG
Protection

Project — Effect of Grazing on Reproduction - Santa Barbara.

Purpose — To determine the effect of sheep grazing on the amount and growth of Jeffrey pine reproduction on the Santa Barbara Forest.

Status — There is an area of approximately 2,000 acres of Merchantable timber within the sheep range on Mt. Pinos on the Santa Barbara Forest. A few years ago it was found that considerable damage was being done to reproduction by sheep and when it was called to the attention of the permittee, the Kern County Land and Cattle Co., their manager stated that they were as much interested in preserving the timber on the mountain as the Forest Service since they had private holdings within the area, and would agree to fence it against all stock. This was readily agreed to by the Forest Service and in the fall of 1923 a fence embracing 1,800 acres of the commercial Jeffrey pine timber land was completed by this company.

In 1926 a fifty foot sample plot was laid out on the sheep range outside the fence and another of like size was placed within the fence on a similar site. Within each sample plot a forty-inch vegetation quadrat was laid out and a third on a better site was laid out at a lower elevation within the enclosure. All sample plots and quadrats were carefully charted and the age and height of the tree seedlings noted.

It was proposed to keep the area closed to livestock permanently and a portion of it will be used for summer home sites and other recreational purposes. When fenced, the area was no doubt in about the same condition as that outside the fence except on a small area at a lower elevation where forage matures earlier and has been better able to withstand the heavy grazing. At the present time the area seems to show there has been a large increase in the total number of all herbaceous species, especially the annual weeds.

Plans — All plots and quadrats will be observed from year to year and recharted at the end of each three year period.

Assignment — Santa Barbara Forest.

January 24, 1927.

RS
Investigative Program

Project — Forage Requirements for Deer - California.

Purpose — To determine the forage habits of deer at different seasons of the year and the amount of food available at critical periods.

Status — Eight deer proof enclosures one rod square have been constructed on the California Forest, four on the summer range and four on the winter range. These enclose the main species used by deer during the different seasons. In those plots on the winter range, for instance, are numerous annual grasses and weeds, white oak, live oak, mountain mahogany, and chamise, while those on the summer range contain cherry, white thorn, garry oak, and numerous annual and perennial weeds. This latter area has been severely overgrazed by all classes of stock, the original and most severe damage being done by goats. These plots will therefore serve as a check on the recovery of vegetation and indicate the plant succession on severely overgrazed areas in addition to any information they may yield upon the project itself.

The area of summer range, on which the plots are located, is closed to grazing by domestic stock for revegetation and game, while the area of deer winter range is used by domestic stock only during spring and fall, the grazing season being from April 16 to October 15, and grazing is confined to the first and last month of this season. Since the areas are usually under close supervision it is quite certain there will be no use by domestic stock on the winter range outside the grazing permit period, and on the summer range trespassing is kept to a minimum. This makes it possible to assume that all utilization that takes place on these areas while they are under observation is being made by game animals.

Deer were counted on the winter range in March, 1926, and considerable information was secured concerning their habits at that time. Counts

will be made when conditions are favorable every few years on this and other areas of winter range on theforest in order to keep a check on their numbers to gather additional information on their habits and to determine the amount of forage available at critical periods.

Junior Range Examiner Robinson has collected much valuable information on the use of various plants by deer which will be correlated with the findings on the California Forest.

Plans

The plots will be charted in May or June this year and recharted at the end of each three year period, while observations will be made each year in checking the utilization by game animals against the unused enclosures. Date of completion indefinite. The study will be continued and perhaps enlarged if it seems advisable.

January 24, 1927.

RG

Project — Management of the Principal Forage Types in the California National Forests.

Purpose — To set up for the principal forage types of the major life zones within the national forests of the state the main features of grazing management for use in the preparation of grazing working plans on the various forests and the correlation of plans between forests in the District.

Status — Forage types are to be grouped into broad classes whose distribution can be traced through adjacent forests. The general occurrence of these is to be indicated on a state map and a list of the principal plants by classes that occur in each type prepared. The palatability of these plants is indicated as well as the average date when vegetational readiness occurs. In addition to this such information as the class of stock for which the type is best suited, the number of surface acres required to support one head of each class of stock for a month or for the recommended season, also the species of poisonous plants that are apt to occur, the class of stock that may be poisoned and at what period of the grazing season. The forage types are grouped according to their occurrence in the commonly recognized life zones as indicated by timber types. Beginning with the highest and combined into groups which represent fairly homogenous grazing zones, they are as follows:

1. High mountain summits with scattered timber (alpine or subalpine type).
2. High mountains heavily timbered (red fir, white fir, lodgepole pine).
3. Intermediate mountain country (yellow pine, Douglas fir, sugar pine).
4. Low mountain and foothill country (woodland and chaparral).

Grazing specialists familiar with conditions have worked up or are working up this information on the following Forests: California, Klamath, Modoc,

Sequoia, Stanislaus, and Tahoe. These are alternate forests throughout the northern part of the state and the reports should provide sufficient information upon which to correlate management data for the intervening forests as soon as their type and zone maps are prepared. The plan can easily be extended to the four remaining forests in the southern part of the state since practically all of their area falls within the woodland and chaparral zone where the forage is annual grass and is used yearlong to a large extent.

Plans

The material available will be correlated this winter and a tentative draft prepared for the whole state during next winter. However, final data can not be secured on all points since it will be necessary to continue observations over a period of years in order to draw definite conclusions as to the proper management of the different types of each of the important grazing zones.

Assignment

F. P. Cronemiller and special grazing men in the District.

January 24, 1927.

RG
Poisonous Plants

Project	Chemical Eradication of Poisonous Plants - Tahoe.
Purpose	To determine the efficacy of chemicals in the eradication of poisonous plants on the range.
Status	"KMG" liquid, a chemical containing an arsenic derivative, has been successfully used on the farms of this state for the eradication of morning glory and other obnoxious weeds and is recommended, by the company who makes it, for the eradication of poison oak. It was felt that if it was of value in killing out such shrubs as poison oak it might be possible to use it for the eradication of the various laurels which are abundant in many portions of the Sierras. The Bureau of Plant Industry is at present conducting experiments on the chemical eradication of gooseberries and have found the "Atlas Weed Killer", a preparation put out by the Chipman Chemical Co. of Palo Alto, to be effective in their eradication and it is believed that where shrubs occur in any quantity that their eradication by the use of this chemical would be much less expensive than hand grubbing. this chemical is much easier to handle than the "KMG" liquid and is not toxic to livestock. The Bureau of Plant Industry has not used the latter preparation on account of its particular poisonous content since it was felt that its use might result in the poisoning of livestock and game animals. Experiments by the "KMG" company have shown the sprayed plants to be quite unpalatable, as evidenced by their placing goats in a pen for a twenty-four hour period with no other forage available. Care will be used, however, to avoid the possibility of stock being poisoned.
Plans	It is planned to conduct a series of tests on laurels, lupines, and perhaps other herbaceous poisonous plants to determine the value of these chemicals in the eradication of shrubby and herbaceous plants. Date of completion indefinite. Sufficient information should be secured in one season's trial to give the desired information.
Assignment	Assistant Range Examiner L. S. Smith, Tahoe.

January 21, 1927.

RG
Handling Stock

Project	Management of Browse Range.
Purpose	To determine: 1. The carrying capacity of browse range for cattle. 2. Proper season of use. 3. Standards of utilization.
Status	The proper use of the browse ranges in the timber belt of the Sierra, where sweet birch forms seventy-five per cent of the forage and over, is one of the most difficult problems in forage utilization in the District. So far there is no definite conception of standards of utilization on these areas and their carrying capacity under any standard is very difficult to estimate. An attempt will be made to solve the various phases of the problem by the construction of enclosures, use of quadrats. and perhaps by artificial harvesting and weighing of air-dried material. At the same time a very intensive series of observations would be conducted on the actual use of browse areas.
Assignment	Assistant Range Examiner L. S. Smith will handle this problem on the Tahoe. The first year's work will probably not be more than a determination of the method of attack.

January 24, 1927.

RP
Seasoning, Air
Project PL-257

Project	Study of Air Seasoning in California.
Purpose	To study the more important variables in the air seasoning process and to deduce therefrom improved practices based upon sound principles. Part of inter-district and Laboratory project.
Status	Project supposed to have been closed in 1925. At the Madison Products Conference, May, 1926, it was decided to prepare a bulletin on The Air Seasoning of Western Soft Woods, Mr. Fullaway of District 1 being assigned to the job, with whatever assistance he might require from Districts 6 and 5. This assistance has required, besides collaboration on the outline, a trip of 2-1/2 weeks in November by Mr. Hill with him and Gibbons through the mills where project work was carried on in this district, and the furnishing of a considerable volume of data, the preparation of which ran over the end of the calendar year.
Plans	Completion of data and forwarding to Mr. Fullaway. Date of completion January, 1927.
Assignment	M. R. Brundage.

January 24, 1927.

RP
Seasoning
Survey

Project	Seasoning Survey of California Lumber Industry, With Special Reference to Costs.
Purpose	To determine and record in detail the seasoning methods, both air and kiln, used at the sawmills in this District and to segregate and record by the various steps the costs of seasoning by both processes.
Status	Project dropped during 1926 as part of effort to reduce program.
Plans	Lumber industry holds this project as of first importance; important also to national forest timber appraisals as a factor in possible raising of level of efficiency upon which appraisals are based. Cannot, however, be taken up again until personnel is increased.
Assignment	None.

January 24, 1927.

RP
Wood Preservation
Marine Piling Survey

Project	San Francisco Bay Marine Piling Survey.
Purpose	The direction, as Executive Officer of the Committee, of the study and report upon the marine borers of San Francisco Bay, their damage and means of combatting them.
Status	Final report practically ready for printer, after exasperating delays due to causes outside of personal control.
Plans	Publication of final report. Date of completion March, 1927. Committee will be disbanded on publication.
Assignment	C. L. Hill.

January 24, 1927.

RP
Wood Preservation
Inspections

Project	Wood Preservation Inspections.
Purpose	Inspection and record of current condition of service and other test materials installed in this District.
Status	Many of the installations have been in place for many years. Few additions are being made except in exposures to marine borer attack. In respect to this the office has assumed responsibility for the inspection of tests still in progress from the San Francisco Bay Marine Piling Committee, and is asked from time to time to install tests by the Forest Products Laboratory.
Plans	1927 work will include placing and inspection of new items received; inspection of Marine Piling Committee tests and others installed; Forest Service PL-120 installation at Fort Mason, San Francisco; fence post lines on Klamath N. F. Pentrex treated poles in Pacific Gas & Electric lines.
Assignment	C. L. Hill and M. R. Brundage.

January 24, 1927.

RP
PL-264
White Fir

Project	Little Used Species - White Fir. (Inter-District and Laboratory Project.)
Purpose	To determine the present stands, production, degree of utilization, and present and possible uses for white fir, with a view to increasing its economic value.
Status	Studies of quantities and grades produced at the mills and found and sold in California retail yards, continued during 1926. Memoranda prepared and sent to Laboratory and other districts.
Plans	This phase of the problem is about finished. A revised report combining previous ones and information subsequently obtained should be prepared. Farther work on this species should be by way of woods and mill waste studies, except for such market information as can continue to be secured incidentally to other work.
Assignment	M. R. Brundage and C. L. Hill.

January 24, 1927.

RP
PL-264
Incense Cedar

Project	Little Used Species - Incense Cedar.
Purpose	To determine the present stands, production, degree of utilization and present and possible uses for incense cedar, with a view to increasing its economic value.
Status	Some information accumulated during the year in connection with the white fir study.
Plans	No separate work to be done on this species during 1927, but incidental collection of data to be continued in anticipation of specific work when the time becomes ripe. Date of completion indefinite.
Assignment	C. L. Hill and M. R. Brundage.

January 24, 1927.

RP
PL-264
Douglas Fir

Project	Little Used Species - Douglas Fir.
Purpose	To determine the present stands, production, degree of utilization and present and possible uses for California grown Douglas fir, with a view to increasing its economic value.
Status	In California, Douglas fir is even more of a problem to lumbermen in portions of the pine region than is white fir. Some valuable information accumulated during the year in connection with the white fir study.
Plans	No separate work to be done on this species during 1927, but incidental collection of data to be continued in anticipation of specific work when personnel or the completion of other projects permit. Date of completion indefinite.
Assignment	C. L. Hill and M. R. Brundage.

January 24, 1927.

RP
PL-264
Native Hardwoods

Project	Little Used Species - Survey of Native Hardwoods.
Purpose	To gain a reconnaissance familiarity with the location and extent of hardwood stands in California, their present utilization and possibilities for improving and extending it.
Status	The projected survey of native hardwoods by the University of California Forestry School and the State Forester, in which this office expected during 1926 to lend such assistance as it could was disrupted by the transfer of Professor Metcalf, who was chiefly pushing the project, from the Forestry School staff to the position of State Extension Forester.
Plans	No specific project work contemplated for 1927, but incidental gathering of data will be continued in preparation for the more intensive work which within a few years will be made necessary by growing industrial demand.
Assignment	C. L. Hill and M. R. Brundage.

January 24, 1927.

RP
Lumbering
Mill Scale Studies

Project	Mill Scale Studies.
Purpose	Study of the grades and amounts of lumber produced by saw mills, comparison of the same with the amounts indicated by log scale and of the overrun or under run secured, with reference to timber defect and manufacturing waste.
Status	No primarily Products projects for a number of years past. In both 1925 and 1926, however, Products cooperated with Forest Management in such studies, for the value which we could obtain from them.
Plans	No projects now in contemplation for 1927. If Forest Management, however, finds it necessary to undertake such a study during the year, we shall if possible cooperate again. Such studies will in future become a part of the broader sawmill waste studies contemplated by Products by the summer of 1928 and will in that connection doubtless become a primary Products function rather than a Forest Management one, except for special emergency cases such as was the study carried out in 1926.
Assignment	Conditional, M. R. Brundage for 1927.

January 24, 1927.

RP
RE-Census
Lumber

Project	Annual lumber and timber products census (Forest Service cooperation with Census Bureau).
Purpose	To gather statistics of the annual production of lumber and timber products in this administrative district for the Bureau of the Census.
Status	This project has been conducted on a cooperative basis for several years. On the outcome of the Controller General's suspension of reimbursement from the Census Bureau to this office for expenses incurred in conduct of the 1925 census, just made at the close of the calendar year, will doubtless hang continuance of the cooperation.
Plans	If reimbursement for expenses incurred is satisfactorily adjusted the project will be continued as long as cooperative agreements with the Bureau are continued by the Forester.
Assignment	Special census employe in Products office; others of Products force as necessary.

January 24, 1927.

RP
RE-Lumber Distribution

Project	Statistics of annual lumber shipment distribution (in cooperation with California White and Sugar Pine Manufacturers' Association).
Purpose	To show the annual shipment distribution, by species and grades, of lumber produced by member mills of the above association.
Status	Killed during 1926, as a project involving computation by Products of Pine Association detailed records, in course of endeavor to reduce program, because of decreasing need of it by Washington office. The Pine Association thereupon began computation of the data into a master sheet for themselves and we can obtain it by ourselves typing their pen sheet and supplying the Association with a carbon copy.
Plans	The record value of these data is believed to be sufficient to warrant clerical cost of typing, inasmuch as they give distribution by grades, which is not supplied by Census form D data.
Assignment	None except clerical, 3 days to a week, depending on amount of computation errors encountered, which has in the past been considerable in computation done by the Association.

January 24, 1927.

RP
RE-Prices
Mill

Project	Annual mill prices of lumber.
Purpose	To maintain a graphic record of f.o.b. mill prices of selected representative grades of the lumber species produced in California for administrative use.
Status	Continuing project.
Assignment	Clerical force with technical supervision.

January 24, 1927.

RP
RE-Prices
Stumpage

Project	Annual data on stumpage prices.
Purpose	To secure as much data as possible on prices and other pertinent data concerning stumpage transfers within the region of this District.
Status	Carried on by circularization in connection with annual lumber census, supplemented by data gathered by Forest Management logging engineers and through personal contacts both by Management and Products.
Plans	Continuing project.
Assignment	C. L. Hill, M. R. Brundage, and clerical force.

January 24, 1927.

RP
Industrial Studies
Major Uses

Project	Major uses of wood in California.
Purpose	To assemble information concerning the consumption of wood in California by broad classes such as building construction, boxes and crates, railroad use, poles, and piling, firewood, etc.; also segregating rural and urban use. Will have large value to the "Economic Study" now carried by the California Forest Experiment Station, as well as for general economic needs.
Status	Project started 1926 through temporary employment and subsequent contributed time of W. C. Hodge. A considerable volume of data collected but a number of baffling difficulties encountered. In the midst of analysis of results secured and appraisal of progress Mr. Hodge very suddenly passed away.
Plans	Entire restudy of status necessary, involving say 3 weeks time; further work to be done decendent upon that analysis and relation of work needed to personnel time available.
Assignment	C. L. Hill and M. R. Brundage with temporary technical help should a competent man become available.

January 24, 1927.

RP
Laboratory Cooperation
Paint Test Fence (PL-262)

Project	Fresno, California, paint test fence (primarily Laboratory project).
Purpose	To determine the effect upon paint coats applied to different species of wood, in flat and edge grain panels respectively, of the species, grain of panel, defects, and other characteristics of the woods used.
Status	Fence erected by the District in 1924. Inspections by Laboratory and District men in subsequent years. Additions made to fence by cooperating company, for study of additional phases, in 1925 and 1926. Deterioration of paint now progressing rapidly and revealing very significant facts and relations.
Plan	Participation with Laboratory in annual inspections whenever possible. Date of completion indefinite.
Assignment	C. L. Hill.

January 24, 1927.

RP
Laboratory Cooperation
Moisture Equilibrium Test (PL-134)

Project	Moisture Equilibrium Test (Laboratory Project).
Purpose	To determine the effect of fluctuating climatic conditions upon the moisture content of specimens of various species of wood, uncoated and coated with various finishes.
Status	Eighteen specimens, received from the Laboratory in April, 1925, are hung in free air in a ferry slip approach in the Ferry Building, San Francisco. Specimens weighed monthly, with occasional inspection of condition of coatings, and report made to Laboratory.
Plans	Continuing project as long as desired by Laboratory.
Assignment	Any member of Products force as convenient. Coating inspections by technical men.

January 24, 1927.

RP
Destructive Agencies
White Ants

Project	Study of termite activity and damage in California and means of combating it.
Purpose	This activity is special reference to the epidemic developments in southern California and assistance toward the adoption of protective measures proposed by the Bureau of Entomology and the Forest Products Laboratory, in the Pacific Coast Uniform Building Code.
Status	This activity - it can doubtfully be called a project - follows considerable incidental attention to the subject. Investigation of the Pasadena situation was specifically requested by the Laboratory, supplemented by correspondence direct from Dr. T. E. Snyder of the Bureau of Entomology.
Plans	Effort to secure financing for a trip to California by Dr. Snyder is not believed wise beyond what can be done incidentally. Should he and Mr. Hunt of the Laboratory not be able to come, however, the importance of securing public adoption of effective remedial measures, especially in the forthcoming Pacific Coast Uniform Building Code, is such as to call for a trip for study and assistance on the part of this office in conjunction with the District Pathologist, which would probably require some two weeks. Date of completion of specific activity 1927.
Assignment	C. L. Hill.

January 24, 1927.

RP
California Economic
Research Council

Project	Participation in the work of the California Economic Research Council by Mr. Hill as member of Executive Committee and Chairman of Committee on Natural Resources.
Purposes	Objects of Council are to secure (1) an information clearing center for workers in economic research; (2) stimulation of needed research and reduction of duplication in such work; (3) standardization of method in research on the same subjects, so as to make results comparable. Objects of Forest Service participation, especially through the chairmanship of the Committee on Natural Resources, is to advance research in respect to the forest resource, and to utilize to that end such prestige as may accrue from the chairmanship connection.
Status	New project 1926. Council organized in April. Recommendations of Natural Resources Committee given Council approval on two soils projects.
Plans	Recommendations on climate and on snowfall surveys in process of formulation for spring meeting of Council. Will then turn attention to forestry projects.
Assignment	C. L. Hill.

January 24, 1927.

RP
Lumbering
Survey of Sawmill Practice

Project	Survey of sawmill practice.
Purpose	To extend data on sawmill practice in this region needed for general Products activities, and in particular for future detailed studies of sawmill waste and conversion efficiency.
Status	New project 1927. A trip is planned for Brundage to District 1 where detailed studies are now in progress, as a preparation for undertaking them here. The survey will be participated in by both Brundage and Hill.
Assignment	C. L. Hill and M. R. Brundage.

January 24, 1927.

RP
Lumbering
Logging Waste Studies

Project	Study of logging waste in California lumbering.
Purpose	To determine the conversion efficiency of California logging operations, and especially the nature, amount and forms of waste now left by them, with particular reference to its utilization and consequent reduction.
Status	New project 1927. A trip is planned for Brundage to District 6 where such studies are now in progress in connection with his trip to District 6 on sawmill waste studies. Working plans will be completed during the remainder of this year for work to be carried out in 1928.
Assignment	M. R. Brundage and C. L. Hill.

January 24, 1927.

RP
Industrial Studies
Wood Using Industries

Project	Wood using industries of California.
Purpose	To determine the amounts of wood used, by species, grade and form requirements, in industrial wood refabrication in California. The ultimate object of such a study is to promote the most effective utilization of each species, with special reference to waste now incurred throughout the production and utilization processes.
Status	Project in view for several years past. Should precede studies of p resent wastes, but can only be undertaken with increased personnel available.
Assignment	(If undertaken) C. L. Hill.

January 24, 1927.

RP
Economic Studies
Markets

Project	Market Studies.
Purpose	To determine, for specific strategic market centers, the species, quantity, grade and form demands in lumber and other wood products of those market centers, for their bearing upon the District "Economic Study" and national forest timber management plans, as well as other economic problems.
Status	Project in mind for several years. Omitted in 1926 in endeavor to cut down program. Can only be undertaken with increased personnel.
Assignment	None until increased personnel is available.

January 24, 1927.

RP
Collateral Utilization
Heptane

Project	Study of production of heptane from tapping of Jeffrey pine and possibly Digger pine. (Joint project with California Experiment Station.)
Purpose	To determine the best practices in tapping Jeffrey and Digger pines for the production of heptane, with their influence upon yields and costs. The Experiment Station would at the same time study the effect of tapping upon the health and growth of the trees.
Status	Conditional new project only. Definite negotiations are now in progress looking to such an operation. If this materializes, the Forest Service must, for its own protection in respect to cuppage sales, make such studies.
Assignment	(If undertaken) C. L. Hill.

January 24, 1927.

Project 813

Title	The reproduction of native timber trees.
When Initiated	1926.
Results to Date	None.
Application	To silviculture in all California. It is an attempt to study survival and growth through a thorough investigation into the ecology and physiology of the tree - from seed liberation to an age of 5 years.
Work for 1927	Two phases will be given most careful attention: 1. The effect of high temperatures (isolation) on seedlings of conifers. 2. A preliminary study of root development as affected by soil texture and moisture content. The first will be carried on substantially as outlined by Bates in similar work - exposing seedlings to a radiant heater - but using more refined methods and a larger number of experiments. The second will consist essentially of a large series of seedlings grown in soils of different qualities. At frequent periods seedlings will be dugup and their root development noted. Some additional work will be carried out in the older projects as indicated in the individual discussion of them.

January 24, 1927.

Project 755 - Growth and Yield Studies

Title

Growth of even-aged stands with special reference to:
1. White fir.
2. Red fir.

When Initiated

White fir work - June, 1925.
Red fir work - May, 1926.

Results to date

White fir results published in U. S. Agri. Exp. Sta. Bull. 407.
Red fir work is divided into two parts:

1. A statistical study of stem form and form variation of individual trees. This study should indicate the most suitable kind of volume table to be used as the basis for the yield study. The work is being done by V. L. Harper, Assistant in Forestry.

2. Yield study of red fir in normally-stocked, unthinned even-aged stands. Basic data are 154 temporary sample plots. At the present time distributions of trees by d.b.h. classes are being studied, as the volume yield study must be deferred until suitable volume tables are constructed.

Application

It is expected that the results of both white fir and red fir yield studies will be used in a later study of the yields of even-aged stands in mixed types.

Work for 1927

Old Projects: The stem form and yield studies of red fir will be pushed to conclusion.

New Projects: It is proposed that the yield study of even-aged stands be carried on for other species that are found in pure type. Studies in pure stands of Douglas fir will be undertaken in 1927.

January 24, 1927.

Project 720 - Range Management.

Title	Revegetation and maintenance of California foothill ranges.
Subtitle	720-A. Range improvement by reseeding.
When Initiated	1922.
Results to date	Natural reseeding studies are handled partly in cooperation with Farm Advisers and partly independently. Detailed successional and seed studies in 1926 were handled in five counties representing major forage types. Considerable data are available that indicate (a) the trend of succession under pasture use and (b) when year-long protected.
Application	Deferred and rotation grazing and better management generally.

Subtitle	720-B. Range improvement by burning.
When Initiated	1925.
Results to date	Various results recorded, mostly in favor of burning where erosion is not a serious factor. On some areas undesirable brush species invade the lands following burning. Such areas should be reburned probably three years after the first burn.
Application	It appears that brush burning done at the right time and at proper intervals may greatly reduce the undesirable brush cover on much of our range land below the commercial timber belt and result in increased grazing capacity.
Work for 1927	This project will be a very active one in 1927. It is not the present plan to burn new areas but rather to endeavor to extend this work to include the study on areas already burned and on new burns made by stockmen under supervision of the State Forester.

January 24, 1927.

Project 814 - Forest Management and Logging.

Title	Factors affecting forest management in California.
When Initiated	1926.
Results to date	No active part of the project is being pursued. Part of literature is reviewed.
Work for 1927	New Projects:

Project 814-A. Time study of tractor logging- to be started approximately May 15. Field work to be followed until July 15. Calculations of field data then to be made at Berkeley.

Project 814-B. Cost of selective logging. Calculations on original data of Project 430 to be started August 1. Remainder of Project 814-B to be held up until completion of Project 814-A.

Subtitle	720-C. Nutritive qualities of forage types and food stores in roots.
When Initiated	1926.
Results to date	No definite results, work vigorously under way. Nutritive qualities of forage are being determined by actual digestion tests, using sheep. The feeding values of forage at different stages of growth and variously weathered are being determined. Stores of food in roots and crowns of Stipa pulchra are being made throughout the grand period of growth. Some specimens are clipped to simulate grazing.
Application	Digestion tests should indicate practicability of supplemental feeding during critical periods and the kind of concentrates to use. Study of the amount and kind of food stores in roots of growing plants should throw light on the most critical period of grazing.